ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

ADDITIONAL SERIES IX.

THE USEFUL PLANTS OF NIGERIA.

PART III.

IMPERIAL BUREAU
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MYCOLOGY

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34/D

GAMOPETALAE.

RUBIACEAE.

SARCOCEPHALUS, Afzel.

Sarcocephalus esculentus, *Afzel.*; Fl. Trop. Afr. III. p. 38.

var. **eu-esculentus,** *Havil.* Journ. Linn. Soc. xxxiii. 1897-98, p. 26.

Ill.—Hort. Trans. v. (1824) t. 18; Bull. Soc. Bot. Fr. xxxii. (1885) t. 3 (anatomy of leaf, fl. and adult bark); Christy, New Comm. Pl. and Drugs, No. 9, 1886, pp. 7 and 8, t. 1 (formation of secondary bark), t. 2 (fl. leaf and adult bark); Pobéguin, Fl. Guin. Franç. t. 57; Thompson, Col. Rep. Misc. No. 66, 1910, t. 18.

Vernac. names.—Tafasiya (Lokoja, Baikie); Ewe Egbesi or Agbesi (Oyo, S. Nigeria, Imp. Inst. No. 3, 1909, Herb. Kew); Opepe (Oshun Reserve, Col. Rep. Ann. No. 695, 1911, p. 12); Egbesi (Lagos, *MacGregor*, *Phillips*, *Dawodu*); Agbassy, Doi, Dundaka, Wuacruli (Sierra Leone, *Scott Elliot*) [Doy (Bassa), Amelliki (Sierra Leone) *Heckel & Schlagdenhauffen*, *Winterbottom*]; Doundaké (Sousou, *Heckel*, *Pobéguin*, *Christy*); Jadali (Toucouleur, *Heckel*); Tétéré (Mbonoi, *Pobéguin*); Viku (Congo, *Chevalier*); Kisia or Kishia, Ekusawa (Gold Coast, *Thompson*); Badi (Malinké, *Pobéguin*); Woacroolie (W. Africa, *Christy*); Adesekanchie (W. Africa, Pharm. Journ. [4] x. p. 279).—African or Negro Peach, African Fig, African Quinine, Quinquina africain, Kina du Rio-Nunez, Yellow Fever Root.

Ado River, Lagos (Millen, No. 132, Herb. Kew); Lagos (MacGregor, No. 28, 1901, Dawodu, No. 23, 1901, Herb. Kew); Nupe (Barter, No. 1244, 1858, Herb. Kew); Shaki Road, Lagos (Denton, No. 14, 1900, Herb. Kew); Oyo, S. Nigeria (Imp. Inst. No. 3, 1909, Herb. Kew); Sierra Leone, Gold Coast and West Africa in general.

var. **Russegeri,** *Havil.* Journ, Linn. Soc. xxxiii. 1897-98, p. 26.

[*S. Russegeri*, Kotschy; Fl. Trop. Afr. iii. p. 39.]

Ill.—Schweinf. Reliq. Kotschyanae, t. 33 (*S. Russegeri*).

Vernac. names.—Nou (Sudan, *Broun*); Mutama (Lunyoro, Uganda, *Dawe*).

Kontagora (Dalziel, No. 219, 1905, Herb. Kew), and found in Acholi, Uganda (Dawe, No. 836, 1905, Herb. Kew), Niam-Niam, Bahr-el-Ghazal, Sudan (Broun, Herb. Kew), Djur-land (Schweinfurth, No. 3746, Herb. Kew) and Madi (Speke and Grant), apparently confined to the drier interior of West and Central Africa.

Fruit edible—taste of an apple, size 2 in. in diameter (Grant, Trans. Linn. Soc. xxix. 1875, p. 81, *S. Russegeri*); fragrant and not unpleasant, colour deep red (Barter, No. 1244, Herb. Kew, *S. esculentus*); flavour like a strawberry, though the odour is rather that of an apple, sold in the markets of Sierra Leone as

"peach" or "fig": eaten in excess it acts as an emetic (Journ. Soc. Arts. xxxv. 1887, p. 995, *S. esculentus*).

The root is said to be a fine bitter tonic, extensively prescribed for indigestion (l.c.). Sometimes exported from West Africa under the names of "Peach Root," and considered as an astringent and febrifuge capable of replacing cinchona bark (Pharm. Journ. [3] xv. 1885, p. 614) though since not justified as a complete substitute (Bull. Imp. Inst. 1915, p. 46); understood according to Ward to be the base of an "African peach bitter" sold in London (Pharm. Journ. [4] x. 1900, p. 280); and it is used as a yellow stain for leather, Oyo, S. Nigeria (Imp. Inst. No. 3, Herb. Kew; Mus. Kew.) A dark yellow dye used in the preparation of "Kano" or "Morocco" leather is obtained from the root of "Agbesi" (Dudgeon, Agric. and For. Prod. B. W. Afr. p. 138). The bark is very bitter (Millen, Herb. Kew), a valuable bitter, possessing febrifuge qualities and suggested as a local equivalent for quinine (Journ. Soc. Arts, l.c.), used by the natives in medicine, recommended for indigestion and said to have an action similar to that of Cocaine (Haviland, l.c. p. 26); an infusion used as a febrifuge, French Guinea (Pobéguin, Fl. Guin. Franç. p. 312). As a dye, it has met with an unfavourable report (in London), "the colouring matter does not take well and it is in every way inferior to French Berries" [*Rhamnus infectoria*], (Christy, New Comm. Pl. and Drugs, No. 11, 1889, p. 87).

The leaves are also used for medicinal purposes in French Guinea (L'Agric. prat. pays chauds, xi. part 2, 1911, p. 139).

The wood is said to be used in the colony as a yellow dye, but proved on examination to be of no value for this purpose (Col. Rep. Ann. No. 695, 1911, p. 40; 687, 1911, p. 39). It is said to be exported from the Congo under the name of "Viku," though of little value (Chevalier, Bois de Cote d'Ivoire, in Les. Veg. Util. Afr. Franç. fasc. v. p. 230); cut into boards and used for tables, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, *Sarcocephalus esculentus*, p. 35); makes good fuel (Thompson, Col. Rep. Misc. No. 66, 1910, p. 50); variously described as yellowish, no difference in heartwood and sapwood (Chevalier, l.c.); bright yellowish, hard and durable (Thompson, l.c. p. 20); and red (Broun, Herb. Kew); density, 0·676 [= 42 lbs. per cubic foot] (Chevalier, l.c.); sp. gr. 0·589 (including bark $\frac{1}{4}$ inch thick) = 37 lbs. per cubic foot, according to a specimen in the Kew Museum.

May be propagated by seed; is being established in the Oshun Reserve (Col. Rep. Ann. No. 695, 1911, (for 1910) p. 12). Found as a tree 20 ft. in height, Ado river, Lagos (Millen, Herb. Kew, *S. esculentus*); a tree, but often a scandent shrub 10–25 ft. high, Nupe (Barter, Herb. Kew, *S. esculentus*); of a large size in the moist forests, habit of a shrub inland, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 20, *S. esculentus*); a shrub common in the bush, Kontagora (Dalziel, Herb. Kew, *S. Russegeri*); a middle-sized tree, Sudan (Broun, Herb. Kew, *S. Russegeri*).

Fruit ripening in October, Nupe (Barter, l.c.), in February at Madi (Grant, Trans. Linn. Soc. xxix, p. 81, *S. Russegeri*).

Ref.—"Doundake Barks," in New Commercial Plants and Drugs. Christy, No. 8, 1885, pp. 45-47.——"Doundake and its Bark" (Quinquina africain or Kina du Rio Nunez) by E. Heckel and F. Schlagdenhauffen, in Pharm. Journ. [3] xvi. 1885, pp. 49-51; Abstract from Journ. de Pharmacie, April 1st and 15th [5] xi. 1885.——"Doundake (*Sarcocephalus esculentus*)," in New Comm. Pl. and Drugs, No. 9, 1886, pp. 7-9.——"Adesekanchie," in Pharm. Journ. [4] x. 1900, "Some West African Drugs," by J. Slinger Ward, p. 280.

MITRAGYNA, Korth.

Mitragyna africana, *Korth.* Fl. Trop. Afr. III. p. 40.

Ill.—Usteri, Delectus Opusc. Bot. ii. t. 3 (*Uncaria inermis*); Hook. Fl. Nigrit. t. 37 (*Platanocarpum africanum*); Hook. Ic. Pl. t. 787 (*Nauclea platanocarpa*).

Vernac. names.—Gagayah or Gigeya (N. Nigeria, Imp. Inst. No. 36726, Herb. Kew); Kratchi (Gold Coast, *Anderson*); Kawin? (Gold Coast, *Rothschild*); Diou, Khoti (French Guinea, *Pobéguin*).

Attah (Vogel, No. 40 Herb. Kew), Nupe (Barter, No. 1189, Herb. Kew), Yola (Shaw, No. 62, Herb. Kew), Bornu (Elliott, No. 120, Herb. Kew), Zungeru (Elliott, No. 5, l.c.) and widely distributed in West Africa.

The wood is used for carving, and Mussulman writing boards are made of it, Nupe (Barter, Herb. Kew), for tools—planes, etc. (Gold Coast, Mus Kew). A specimen in the Kew Museum has specific gravity 0·594 = 37 lb. per cubic foot.

The leaves are used medicinally in French Guinea (Pobéguin, Pl. Med. du Guin. Franç. L'Agric. prat. pays chauds, xi. 2, 1911, p. 42). The bark is used medicinally in venereal disease, Yola (Shaw, Herb. Kew); yields a yellow dye (Pobéguin, l.c.).

Found as a tree up to 30 ft., very common in moist ground, Nupe (Barter, Herb. Kew), a low shrub, Maigumeri, Bornu (Elliott, Herb. Kew), a scrambling shrub, common around Zungeru (l.c.), a tree, 40 ft., Yola (Shaw, Herb. Kew), a shrub or small tree, 15 feet high, very common isolated and in river woods on alluvium of the Niger, Farana, Sierra Leone (Scott Elliot, Herb. Kew), and as a tree characteristic of the swamps in the dry open country, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 72).

Mitragyna macrophylla, *Hiern,* Fl. Trop. Afr. III. p. 41.

Ill.—Haviland, in Journ. Linn. Soc. xxxiii. 1897–98, t. 4, ff. 1–10 (Anal. of fl. fr. seed, etc.); Chevalier, Les Veg. Util. L'Afriq. Trop. Franç. Fasc. vi. p. 352, f. 47.

Vernac. names.—Baya, Yaya or Yar-yar (Gold Coast, *Thompson, Brent*); Yaryah yaryah (Gold Coast, *Armitage*);

Bahia, Sofo (French Ivory Coast, *Chevalier, Courtet*); Séfono, Ogouwa (French Ivory Coast, *Courtet*); Mungo (Golungo Alto, *Welwitsch*); Kobodigansu (Sierra Leone, *Scott Elliot*); Fofo, Popo (French Guinea, *Pobéguin*), Bois de Bahia, Tilleul d'Afrique (*Chevalier*).

Eppah (Barter), Nun River (Mann), and found also in Sierra Leone, Gold Coast, Angola, etc.

The wood is used by Kroomen for making canoes (Mann, Herb. Kew), for housebuilding and furniture in Angola (Hiern. Cat. Welw. Afr. Pl. ii. p. 435) and for carpentry work and cabinet making, Ivory Coast (Courtet, L'Agric. prat. pays chauds, x. 1, 1910, p. 457). The density is given by Courtet (l.c.) and Chevalier (Les Veg. Util. L'Afriq. Trop. Franç. Fasc. v. p. 228) as 0·559–0·574. A specimen ["Baya," Gold Coast] in the Kew Museum has specific gravity 0·536 = 34 lb. per cubic foot; 54 lb. per cubic foot is recorded by Armitage (Bull. Imp. Inst. 1910, p. 240)—a cross-grained light brown wood, useful locally but not for export (l.c.); has occasionally been shipped to Europe as "West African Mahogany" (Thompson, Col. Rep. Misc. No. 66, 1910, p. 21) and exploited for timber on the Gold Coast (l.c. p. 36).

The leaves are used for wrapping Kola nuts (*Cola acuminata*), Sierra Leone (Scott Elliot, Herb. Kew, No. 4752; Col. Rep. Misc. No. 3, 1893, p. 55; Pobéguin, Pl. Med. du Guin. Franç. in L'Agric. prat. pays chauds, xi. 2, 1911, p. 43); used medicinally as also the bark in French Guinea (l.c.). The roots are boiled and eaten for colic in Sierra Leone (Scott Elliot, l.c.).

The tree is found in swamps, Gold Coast (Thompson, l.c. p. 21); from 100–114 ft., with a trunk up to 65 ft. without branching, and from 32–40 in. in diameter, common on the banks of rivers and lagunes, Ivory Coast (Chevalier, l.c., Courtet, l.c.); 40–50 ft. high, flower bud and young fruit appearing in October, Golungo Alto (Hiern, l.c. p. 435, *Mamboga stipulosa*); 60 ft. high in the forests of Eppah (Barter, Herb. Kew), 40 ft. high, in swampy ground, Nun River (Mann, Herb. Kew), and 30–40 ft. high in moist forest near Lake Victoria Nyanza, altitude 4000 ft. (Dawe, Herb. Kew).

Uncaria, Schreb.

Uncaria Gambier, *Roxb.* Hort. Beng. p. 86.

A scandent shrub; or a bush under cultivation 8–10 ft. high. Leaves glabrous, ovate or ovate lanceolate, acuminate, 3–4 in. long, $1\frac{1}{2}$–2 in. broad, petioles $\frac{3}{8}$ in., midrib and broadly spaced nervures, prominent on the under-side; green, thick and fleshy when fresh, chocolate on the upper surface, reddish brown below, thin and crumbling readily when dry. Inflorescence loosely globular on axillary peduncles. Flowers small, white.

Ill.—Rumpf, Amb. v. t. 34, ff. 2, 3; Trans. Linn. Soc. ix. (1908) t. 22 (*Nauclea Gambir*); Hayne, Darst. Beschr. Gewächse, x. t. 3 (*Nauclea Gambir*); Nees von Esenbeck, Plant, Medic. Düsseld.

Suppl. (*Nauclea Gambir*); Korthals, Verhandl. Nat. Gesch. Nederl. Bezitt (1839–42) t. 34, ff. 1–2; Berg. Charact. t. 44, No. 340 (*Nauclea Gambir*); Baillon, Hist. Pl. vii. pp. 350–351 (*Ourouparia Gambir*); Bentl. and Trimen, Med. Pl. t. 139; Köhler, Med. Pflan.; Teysmannia, Batavia, xviii. 1907, p. 106.

Gambir or Gambier, Terra Japonica, Pale catechu.

Native of the Malay Peninsula, and largely cultivated there.

The plant was recommended by Kew for cultivation in Lagos, and the Niger Territory as well as in other colonies in 1889 (Kew Bull. 1889, p. 247), but nowhere does it appear to have been commercially successful other than in or near the original countries of production.

An important tanning and dyeing substance is obtained from the leaves. The extract is also used medicinally, and in India for eating with "pán" (Dict. Econ. Prod. India), and countries of origin for chewing with betel-pepper and lime.

The requirements under cultivation are a tropical climate, rich, well-drained loamy soil, and good and regular rainfall, with a good proportion of sunshine. May be propagated by seed or cuttings—the latter for preference. Planted out when about 9–12 in. high, at distances of about 9–12 ft. (538, or 302 plants to the acre). [The practice in Sumatra is to put the plants in to a depth of about 6 in. or just so that the tips show above ground (Journ. D'Agric. Tropicale, 1903, p. 80.)] They begin to yield small crops of leaves in a year's time, and larger supplies after 1½–2 years, when they may be expected to yield at least from two to four harvests of leaves a year for upwards of 20 or 30 years. Careful weeding and good cultivation—manuring, occasional topping to 6 ft. or so, etc., is essential to keep the plantation up to standard.

It is sometimes grown in the Malay States as a catch-crop with Pepper (*Piper nigrum*), and might be similarly tried in rubber plantations.

The preparation is comparatively simple. It consists briefly in boiling the fresh leaves and young shoots in water for about an hour, then straining off the leaves, and reboiling the juice until it thickens to a syrupy consistence, stirring being maintained meanwhile. The extract is then run off, cooled and set or nearly solidified by further stirring or kneading, dried until quite firm, and made up into the usual commercial forms—in blocks or cut and pressed into cubes. The fracture is somewhat earthy and in general appearance it resembles clay.

The stirring during the boiling process is done in the Straits Settlements with three pronged forks, made in one piece, of the hard wood of the "Tampinis" tree (*Sloetia sideroxylon*) about 6 ft. in length, and the setting or kneading sticks are usually made of "Mahang Putih" (*Macaranga hypoleuca*), about 1½ in. thick and 9 in. in length (Mus. Kew). It is not essential that the tools be made of these woods but sizes given should be followed.

The yield is about 5 oz. per tree per annum (Kew Bulletin, 1889, p. 252), which gives a total yeld of about 168 lb. per acre.

Eighty years or so ago the Chinese settlers were producing in the island of Rhio alone, about 4000 tons a year (Dict. Comm. McCulloch, p. 260), chiefly for Java, China and neighbouring countries; the trade with this country was then only beginning and likely to fail because of a duty of £1 per cwt. (twice the prime cost) then in force (l.c.).

From 10s. per cwt. in 1834 the approximate market value in London was 15s. 6d. to 21s. 6d. per cwt. for block, 18s. to 24s. for pressed cubes, and 23s. to 27s. for free cubes in 1882 (Spon's Encyc. p. 1985), 45s. per cwt. in 1889 (Kew Bull. 1889, p. 247), and a sale of 10 tons of cubes was made in Liverpool (quay) at 28s. per cwt. (Chem. and Druggist, Jan. 19th, 1907, p. 96).

The total imports into the United Kingdom in 1910 were 101,120 cwt., value £155,102 equal to 30s. 8d. per cwt.; the greater proportion coming from the Straits Settlements and Dependencies including Labuan (91,480 cwt., value £139,982) and the lesser proportion from Dutch Possessions in the Indian Seas (8880 cwt., value £13,970), Belgium [in transit] (420 cwt., value £625), Germany [in transit] (40 cwt., value £44) and other foreign countries (300 cwt., value £481) (Trade of the United Kingdom, i. 1911, p. 106). In 1906, 80 cwt., value £27, 1907, 20 cwt., value £23, and in 1908, 6400 cwt., value £7520 were imported from other British Possessions from whence no imports in 1909 or 1910 (l.c. p. 106).

Ref.—"Gambier," in Tropical Agriculture, Simmonds, pp. 387–388 (Spon, London, 1877).—"Gambier," in Pharmacographia, Flückiger and Hanbury, pp. 335–338 (Macmillan & Co., London, 1879).——"*Uncaria Gambier*," in Medicinal Plants, Bentley and Trimen, ii. No. 139, 4½ pages (Churchill & Son, London, 1880).——"Gambier, Pale Catechu, or Terra Japonica," in Spon's Encyclopaedia, Div. v. pp. 1984–1985 (London, 1882).——"Notes on Gambier," in Pharm. Journ. [3] xviii. 1888, pp. 863–864.——"Gambier (*Uncaria Gambier*)," in Kew Bull. 1889, pp. 247–253.——"*Uncaria Gambier*," in Medizinal Pflanzen, Köhler, iii. 2 pages.——"Gambir," Ridley, in Agric. Bull. Straits Settlements and Fed. Malay States, Feb. 1892, pp. 20–41, Description, History, Uses, Forms of Gambier, Cultivation and Manufacture.——"La Culture du Gambir," Dr. Meyners D'Estrey, in Revue des Sci. Nat. Appl. i. 1892, pp. 51-53.——"The Production of Gambia [Gambier] in Singapore," in Journ. Soc. Arts, xlii. 1893, pp. 58–59.——"*Uncaria Gambier*," in Dict. Econ. Prod. India, Watt, vi. part 4, 1893, pp. 210–211.——"Gambier in British North Borneo," in Kew Bull. 1893, pp. 139–141.——"*Uncaria Gambier*," in Agric. Ledger, No. 1 1902, p. 45.——"Culture et Préparation du Gambier," in Journ. D'Agric. Tropicale, ii. 1902, pp. 333–334.——La Plantation de Gambir de M. von. Machel, l.c. iii. 1903, pp. 80–81; Abstract "Cultivation of the Gambier Plant in Sumatra," in Bull. Imp.

Inst. i. 1903, pp. 97–98.——"Gambier in the West Indies," in West Indian Bull. iv. No. 1, pp. 80–85.——"De Cultuur en Bereiding van Gambir in Den Riow-Archipel." Dr. W. de Jong, in Teysmannia, xviii. 1907, pp. 16–18; pp. 106–111; pp. 242–245, illustrated.

CINCHONA, Linn.

Cinchona Calisaya, *Wedd.* in Ann. Sc. Nat. Ser. iii. x. (1848), p. 6.

A tall tree, 30–60 ft. high, sometimes shrub-like, 6–12 ft. (King). Leaves obtuse, oblong lanceolate or obovate, glabrous, glossy on the upper surface, 3–6 in. long, petioles about ½ in. long; small indistinct pits in the axils of the midrib and lateral nerves. Inflorescence paniculate; flowers small, white or pale flesh-coloured, fringed, fragrant. Capsule ovoid oblong, about ⅓ of an inch long.

Ill.—Weddell, Hist. Nat. Quinquinas, t. 3, t. 3 bis (var. *Josephiana*), t. 28, ff. 1–4 (bark); Pereira, Mat. Med. ii. f. 325; Paxton, Fl. Gard. iii. t. 107; Lemaire, Le Jard. Fl. iv. 1854, t. 367; Siebold, Fl. Jard. i. 1858, t. 14; Berg. and Schmidt, Darst. and Beschr. Pharm. ii. t. 14d (var. *Josephiana*), t. 15b, ff. A–C (sections of bark); Rev Hort. 1873, p. 113; Howard, Quin. E. Indian Plantations, tt. 7, 8 (*Calisaya javanica*), t. 15 (var. *microcarpa*); Bot. Mag. t. 6434, t. 6052 (var. *Josephiana*); Baillon, Hist. Pl. vii. pp. 338–339; Bentl. and Trimen, Med. Pl. t. 141; Köhler, Med. Pflan. i; Moens, Kinacultuur in Azie, t. 2 (habit), t. 14 (fl. br.), t. 25 (parts of fl. and fr.).

Yellow Bark, Calisaya Bark.

Native of Bolivia, wild and cultivated. Cultivated in India, Java, Ceylon, and St. Thomé (West Africa).

var. **Ledgeriana**, *Howard*, Quin. E. Indian Plantations (1876), p. 84. [*C. Ledgeriana*, Moens, ex Trimen in Journ. Bot. xix. (1881) p. 323.]

A small tree, 25 ft. high and upwards. Leaves lanceolate or elliptic oblong, glabrous, about as long as those of the type, larger in coppice growth. Inflorescence paniculate; flowers yellowish, white fringed, fragrant. Capsule ovoid lanceolate, about ⅓ or nearly ½ in. long.

Ill.—Howard, Quin. E. Indian Plantations, t. 4 (var. *Ledgeriana*, "Macho," form A), t. 5 ("Hembra," form B), t. 6 (form C); Gard. Chron. Oct. 11th, 1879, 2, p. 457, f. 71; Kew Report, 1880, p. 13; Journal Bot. 1881, tt. 222, 223; Flückiger, Chinarind. tt. 2, 3; Flückiger, Cinchona Barks [Power, Transl.], tt. 2, 3; Moens, Kinacultuur in Azie, t. 1 (habit), tt. 12, 13 (fl. br.), t. 23 (parts of fl. and fr.).

Ledger Bark, Yellow Bark, Calisaya Bark.

Native of Bolivia. Cultivated in India, Java, and Ceylon; and under experiment in East Africa.

Cinchona officinalis, *Linn.* Syst. ed. x. (1759), p. 929.

A slender tree 20–30 ft., 8–10 in. diam. at the base (King). Leaves lanceolate ovate lanceolate, acute or shortly acuminate,

glabrous, 3–6 in. long, on long petioles (1–1⅓ in.), pitted in the axils of the midrib and lateral nerves. Inflorescence cymose, terminal and axillary. Capsules ovoid oblong, nearly ¾ in. long.

Ill.—Plenck, Ic. t. 131; Skrivter Nat. Selsk (1790) t. 2; Velloso, Quinogr. Portug. t. 1; Gaertner, Fruct. Sem. Pl. i. t. 33; Lam. Encycl. t. 164, f. 1; Lambert, Cinchona, t. 1; Humb. & Bonpl. Pl. Equinoct. i. t. 10 (*C. condaminea*); Hayne, Darst. Beschr. Gewächse, vii. t. 37 (*C. condaminea*); Wagner, Pharm. Med. Bot. t. 245 (*C. condaminea*); Nees von Esenbeck, Plant. Medic. Düsseld. t. 260 (*C. condaminea*); Woodville, Med. Bot. ii. (1832) t. 91; Steph. & Ch. Med. Bot. t. 183 (*C. condaminea*); Guimpel, Abbild. Beschr. t. 208 (*C. condaminea*); Weddel, Hist. Nat. Quinquinas, tt. 4, 4 bis (*C. condaminea*); Berg. & Schmidt, Darst. & Beschr. Pharm. ii. t. 14 e (C. *Uritusinga*) t. 15 a (*C. chahuarguera*); Bot. Mag. t. 5364; Howard, Illust. Nueva Quin. Pavon, t. 1 (*C. chahuarguera*), t. 2 (*C. crispa*), t. 19 (*C. Uritusinga*); Quin. E. Indian Plantations, t. 11 (var. *Bonplandia*) and Photo. t. 2 (habit, planted in 1863, Dodabetta Plantation, Ootacamund, 7800 ft.); Baillon, Hist. Pl. vii. pp. 340–341; Bentl. and Trimen, Med. Pl. t. 140; Flückiger, Chinarind, t. 5; Cinchona Barks [Power Transl.] t. 5; Köhler, Med. Pflan. i.; Moens, Kinacultuur in Azie, t. 6 (habit), t. 17 (fl. br.).

Crown Bark, Loxa Bark, Pale Bark, Peruvian Bark, Jesuit's Bark, Countess's Powder.

Native of Peru. Cultivated in India, Java, Ceylon.

Cinchona succirubra, *Pavon ex Klotzsch,* in Abh. Akad. Berlin (1857), p. 60.

A tree 50–80 ft. high (Owen), 15–40 ft. (Howard ex Klotzsch). Trunk straight. Leaves soft pubescent, sometimes tomentose, bright green, and ripening to a red especially on the under surface, somewhat chartaceous when dry, larger blade, 4–9 in. long, 3–6 in. broad, than in the other species mentioned, elliptical, acute at the apex and the base. Inflorescence cymose, flowers rose-coloured. Capsule oblong, about an inch or more in length.

Ill.—Velloso, Quinogr. Portug. t. 2 (*C.* "rubra ou colorada"); Howard, Illust. Nueva Quin. Pavon, t. 8 ("Cascarilla Colorada") Quin. E. Indian Plantations, Photo. t. 1 (habit, planted in 1862, First Denison Plantation, Neddivuttum, 6200 ft.); Baillon, Hist. Pl. vii. p. 342; Bentl. and Trimen, Med. Pl. t. 142; Flückiger, Chinarind. t. 1, Cinchona, Barks [Power, transl.] t. 1; Köhler, Med. Pflan. i.; Moens, Kinacult. t. 8 (habit), t. 19 (leaves and fl. br.), t. 29, f. 1 (parts of fl. and fr.).

Red Bark.

Native of Peru. Cultivated in India, Java, Ceylon, Jamaica, St. Thomé (W. Africa), and under experiment in East Africa.

Cinchona is grown entirely for the bark, the properties of which in general are tonic and febrifuge. Sulphate of Quinine is the principal extract. In India a preparation called "cinchona

febrifuge" is used, made chiefly from "Red bark" (*C. succiruba*), the same bark being largely used for making decoctions, febrifuges and pharmaceutical preparations in this country. The bark is admitted through the Customs without reference to source as "Peruvian Bark," the total imports of all kinds under this name in 1910 being 22,469 cwt., value £39,520, of which Java contributed more than one-half (Trade of United Kingdom, i. 1911, p. 102). The exports of cinchona bark from Java in 1912 amounted to 17,809,000 lb., and in 1913, 20,583,000 lb., and the exports of manufactured quinine, 1912, 163,900 lb. and in 1913, 159,450 lb. The quantity of sulphate of quinine manufactured by the Bandoeng factory in 1913 was 68,000 kilos, the price varying from about 8d. to 1s. per oz. (Cons. Rep. Ann. No. 5325, 1914, p. 8). The principal commercial distinctions are "Druggists' Bark"—usually best selected quills or bark of good appearance, and "Manufacturers' Bark"—the appearance of which is of secondary consideration and it is often convenient to ship it in chips to save freight. Into the main forms come various descriptions, as "bright silvery druggists' quills," "loxa quill," "crushed ledgeriana stem chips," "ledgeriana root," "crown chips," "succirubra chips" and "root," "calisaya," "Bolivian cultivated calisaya quill," "African red bark," &c., &c. From 5–7 per cent. of quinine exclusive of other alkaloids is in manufacturers' bark a saleable condition, and the value is based on the unit rate ruling at the time of selling, and the quinine content of samples, Amsterdam being the principal market, where the unit in 1912 was 3·07 to 4·42 cents per half kilo (in London, $\frac{9}{16}$d. to $\frac{7}{8}$d. per lb.), and the average percentage of quinine in manufacturing bark offered being 6·38 (Chem. and Druggist, Jan. 18, 1913, p. 97); and in 1913 at the Amsterdam Auctions the average price per unit was 4·92 cents (Cons. Rep. Ann. No. 5325, 1914, p. 8).

Java—where the planters and manufacturers have formed an agreement which places the industry in a position of stability with regard to prices, etc.—has so far made the greatest commercial success of the production, though India has been equally successful in the cultivation, the object there being mainly to meet the demands for local use and to ensure a position of independence from external sources. As Nigeria opens up, it is not unlikely that some suitable localities will be found for the cultivation of Cinchona especially in the mountainous area from the Bauchi highlands eastwards to the Cameroon Boundary. *C. succirubra*, and *C. Calisaya* are cultivated with success in the island of St. Thomé, at an altitude of about 3500 ft.; this is the nearest approach to the region indicated on the mainland where the altitude reaches 3000 ft. and upwards (*see* part 1, p. 8), and the prime factor of deep rich soil being available there seems to be no reason why Cinchona should not be given a trial.

Upwards of sixty-five works have been published on the subject, comprising books, important papers and official publications, covering the history, cultivation and commerce, but it may be

sufficient to indicate here that everything of ordinary interest will be found in a reference to the illustrated works mentioned above, Parliamentary Returns, containing Copies of Correspondence relating to the Introduction of the Cinchona plant into India and the Proceedings connected with its cultivation (1) March 1852 to March 1863, pp. 1–272; (2) April 1863 to 1866, pp. 1–379; (3) April 1866 to 1870, pp. 1–285; (4) Aug. 1870 to July 1875, pp. 1–190, and (5) continued in a second part pp. 1–190; The Cinchona Planters' Manual, Owen, pp. 1–203 (Ferguson, Colombo, 1881); Handbook of the Cinchona Culture, pp. 1–292, a translation by Dr. Daydon Jackson (De Bussy, Amsterdam, and Trübner & Co., London, 1883), of the portion relating to Cinchona in "De Oost-Indische Cultures in betrekking tot handel en nijverheid," by K. W. van Gorkom (1881), "Cinchona," in The Commercial Products of India, Watt, pp. 302–310 (John Murray, London, 1908) and "Cinchona in Java from 1872 to 1907," by D. Hooper in The Agric. Ledger, No. 4, 1911, pp. 35–106.

Corynanthe, Welw.

Corynanthe paniculata, *Welw.*; Fl. Trop. Afr. III. p. 43.

Ill.—Trans. Linn. Soc. xxvii. t. 14.

Vernac. names.—Anikiba (Benin, *Dennett*); Mangue (Golungo Alto, *Welwitsch*); Mangue do Monte or Paco de Golungo Alto (Portuguese, *Welwitsch*).

Benin, Cameroons, Congo, Angola, etc.

The wood is good for building (Fl. Trop. Afr. l.c.); used in house building and for many other purposes in Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 437); white, hard, durable, of fine grain and very dense (l.c.).

A large tree, Benin City (Dennett, Herb. Kew), 40–60 ft. high, trunk straight, 1–2½ ft. in diam. near the base, forming extensive forests in nearly all the more elevated parts of Quilombo and Mata de Alto Queta, Angola (Hiern, Cat. Welw. Afr. Pl. ii. p. 437); a tree 25–40 ft. or a shrub 12–15 ft. high (Fl. Trop. Afr. l.c.).

Corynanthe Yohimbe, K. Schum., the "Yohimbe" of the Cameroons, "Endun" of the French Congo, is the source of the "Yohimbe bark," from which the alkaloid "Yohimbine" is obtained. Some particulars of this bark are given in Notizblatt, Bot. Gart. Berlin, No. 25, 1901, "Uber die Stammpflanze der Johimberinde," by E. Gilg and K. Schumann, pp. 92–97, and in S. Nigeria Gazette, July 14, 1909, Suppl. p. 27, "Report by Imp. Inst. on Bark sent by Conservator of Forests S. Nigeria."

There are no specimens at Kew from Nigeria.

Crossopteryx, Fenzl.

Crossopteryx Kotschyana, *Fenzl*; Fl. Trop. Afr. III. p. 44.

Ill.—Kotschy, Pl. Tinneana, tt. 15 a and 15 b; Notizbl. Bot. Gart. Berlin, App. xxii. 1909, p. 39, f. 15 (*C. africana*).

Vernac. names.—Ayeye (Oloke-Meji, *Foster*); Bellenda, Bembee (Sierra Leone, *Winterbottom, Moloney*); Mekingi (Sierra Leone, *Scott Elliot*); Mbili (Sudan, *Broun*); M'taeloambai (Medi. *Grant*); Musésse (Zena do Golungo, Angola, *Welwitsch*).—African Bark.

Nupe, Kontagora, Zungeru, Lagos, and found also in Sierra Leone, Nile Province, Uganda, Togoland, Angola, Upper Chari, Cameroons, Nyasaland, etc.

A medicinal plant, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 56); bark used as a febrifuge, Sierra Leone (Winterbottom, Acct. Sierra Leone, ii. (1803) p. 243; Fl. Trop. Afr. l.c.; Moloney, For. W. Afr. p. 367. Wood, brittle (Fl. Trop. Afr. l.c.; Grant Trans. Linn. Soc. xxix. 1875, p. 82), hard, whitish-yellow, used by the negroes to make spoons, etc. (Hiern, Cat. Welw. Afr. Pl. ii. p. 438). In Madi seeds used by the natives to fumigate their bark-cloths, and powdered to make a pomade for rubbing their bodies (Grant, l.c.).

A small tree, Zungeru and Kontagora (Dalziel, Herb. Kew), 8–15 ft. high with spreading or sub-erect branches, in hilly, wooded, rather dry places, mountains of Mongolo, fruit ripe without flowers, and almost leafless in September, Zena do Golungo, Angola; leaves deciduous at the time of fruiting (July), at Catomba (Hiern, l.c. pp. 437, 438); a tree 20–30 ft. common on laterite plateau, Sierra Leone (Scott Elliot, Herb. Kew); shrub 15 ft., flowers cream-coloured, very fragrant, Nupe (Barter, Herb. Kew), Nile Province, Uganda (Dawe, Herb. Kew), in fruit at Madi in December (Grant, Trans. Linn. Soc. l.c.).

Ref.—"African Bark," in An Account of the Native Africans, Sierra Leone, Winterbottom, ii. pp. 243–253 (London, 1803), chiefly medicinal.

Oldenlandia, Plumier.

Oldenlandia Heynei, *Oliv.*; Fl. Trop. Afr. III. p. 59.

Vernac. names.—Igbale Odan, Apikan (Lagos, *Dawodu*).

Niger, Sierra Leone, and found also in India, Natal and Madagascar.

Used medicinally for children, Lagos (Dawodu, No. 33, Herb. Kew).

An erect or decumbent annual, 1–2 ft. (Fl. Trop. Afr. l.c.), a bushy plant 6–8 in. high, the stems growing flatly on the ground, in plantain groves Uganda and Karagwe (Grant, Trans. Linn. Soc. xxix. 1875, p. 84).

Oldenlandia senegalensis, *Hiern*; Fl. Trop. Afr. III. p. 56.

Ill.—Endl. Atakta Bot. t. 23 (*Kohautia senegalensis*).

Vernac. name.—Temeng-Temeng (Gambia, *Brown Lester*).

Niger, Gambia, Senegambia, etc.

Roots made into native brooms, also used as worm-killer, Gambia (Kew Bull. 1891, p. 272).

Erect annual, 1–3 ft. high, branched from the base (Fl. Trop. Afr. l.c.); 5 ft. high, seen everywhere, collected in long grass, Gambia (Kew Bull. l.c.).

"Kakeis" (*Oldenlandia globosa*, Hiern; Fl. Trop. Afr. iii. p. 54) is said to possess properties somewhat resembling Ipecacuanha and is given in dysentery (Journ. Soc. Arts, xxxv. 1887, "West African Drugs," p. 995). There is a specimen in the Herbarium at Kew, from Angola, but none from Nigeria.

Mussaenda, Linn.

Mussaenda arcuata, *Poir.*; Fl. Trop. Afr. III. p. 68.

Ill.—De Wildeman, Études Fl. Bangala, p. 114.

Vernac. names.—Tsikirity, Vahindanigo or Voandaingo (Madagascar, *Heckel*); Cicrite (Reunion, *Heckel*).

Niger; Nupe.

A decoction of the leaves and stem is a reputed tonic and strengthening drink in Madagascar (Heckel, Ann. L'Inst. Col. Marseille, i. 1903, p. 161). Other medicinal uses are recorded for this plant by Heckel (l.c.).

Mussaenda elegans, *Schum. et Thonn.*; Fl. Trop. Afr. III. p. 69.

N. Nigeria (Elliott, No. 75, Herb. Kew): S. Nigeria (Holland, No. 45 Herb. Kew), and widely distributed in Upper and Lower Guinea, occurring in Mombuttu Land.

A decorative plant; flowers bright scarlet.

Mussaenda erythrophylla, *Schum. et Thonn.*; Fl. Trop. Afr. III. p. 69.

Ill.—Trans. Linn. Soc. xxvii. (1869) t. 13 (*M. splendida*); Bot. Mag. t. 8222; Gard. Chron. Aug. 5th, 1911, p. 91.

Vernac. names.—Dilula, Dilula-Riula, Diluia or Alleluia (Pungo Andongo, *Welwitsch*).

Widely distributed in West Africa, from Sierra Leone to the Cameroons and Angola; extending to Uganda.

The bright scarlet bracts make this an exceedingly handsome decorative plant. Introduced to Kew by Mann in 1863, but lost sight of for some years until sent to Kew by Ridley from Singapore Botanic Gardens, flowered and figured for Bot. Mag. (l.c.) in 1908. Collected for Sander & Sons, on the banks of the Kwilu Loango, French Congo, in 1886.

A graceful shrub climbing to a great height, by far the most beautiful of African shrubs, flowering in December–January (also in fruit) found in moist wooded places, altitude 2000 3000 ft., Golungo Alto: a climbing shrub, 5–6 ft., the flowering branches used to ornament the churches at Easter; the inflorescence much resembles that of *Euphorbia pulcherrima* in brilliancy and floral effect, and it sometimes almost completely covers low trees with its

glowing garlands, Pungo Andongo (Hiern, Cat. Welw. Afr. Pl. ii. pp. 453, 454); found in the Cameroons at an altitude of 3000–4500 ft. (Bot. Mag. l.c.).

Mussaenda Isertiana, *DC.*; Fl. Trop. Afr. III. p. 67.

Vernac. name.—Igi ira (Lagos, *Dawodu*).

Abeokuta (Irving); Lagos Island (Barter); Whydah, Slave Coast (Isert).

A climbing or bushy shrub, 6–15 ft. Inflorescence with large white bracts, flowers yellow; a handsome decorative plant.

Mussaenda tenuiflora, *Benth.*; Fl. Trop. Afr. III. p. 69.

Old Calabar (Thompson, Holland, Nos. 73, 83 & 126, Herb. Kew); Golungo Alto.

A decorative plant. A very elegant shrub, scandent, with long sarmentose branches, calyx green, the enlarged lobe foliaceous, white, soon turning a whitish-sulphur colour, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 453).

Among other Mussaendas that possess some interest as decorative plants may be mentioned *M. Afzelii*, Don. Fl. Trop. Afr. iii. p. 66, collected at Aboh by Vogel, and *M. luteola*, Delile, Fl. Trop. Afr. iii. p. 71, figured in Bot. Mag. t. 5573, from plants grown at Kew in 1866, the seeds being collected by Capt. Grant in the rocky ravines of Gani and Madi, 1863.

Dictyandra, Welw.

Dictyandra arborescens, *Welw.*; Fl. Trop. Afr. III. p. 86.

Vernac. name.—Mungolo oamxi (Golungo Alto, *Welwitsch*).

Old Calabar, and in Angola, the Cameroons, etc.

Timber used for hut-building, in Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 457). A piece of the wood [Cameroons, Zenker] in the Kew Museum has specific gravity 0·737 = 46 lb. per cubic ft.

A tree 15–35 ft. high in the primitive forests, or a stout shrub 8–12 ft., trunk sometimes 2–2½ ft. in diameter, Golungo Alto (l.c.).

Randia, Houst.

Randia genipaeflora, *DC.*; Fl. Trop. Afr. III. p. 95.

Lagos. Also in Sierra Leone and Fernando Po.

Referred to as "Wild Coffee," Fernando Po (Barter, Herb. Kew), and of Sierra Leone (Barter, Mus. Kew); found as a shrub or tree up to 20 ft., fruit globose, ⅓ in. in diameter (Fl. Trop. Afr. l.c.).

Randia macrantha, *DC.*; Fl. Trop Afr. III. p. 97.

Ill.—Salisbury, Parad. Lond. t. 93 (*R. longiflora*); Bot. Mag. t. 3409 (*R. Bowieana*); Bot. Reg. (1846) t. 63 (*Gardenia Devoniana*); Paxton, Mag. xiii. p. 269 (*Gardenia Devoniana*); Fl. des Serres, t. 191 (*Gardenia Devoniana*).

Vernac. name.—Kan-Kan (Yoruba, *Millson, Moloney*).

Eppah; Lagos; Yoruba; the Cameroons and Uganda.

A decorative plant.

A shrub, 9 ft. high, deciduous, Eppah (Barter, Herb. Kew); 30 ft. high, in the Cameroons, altitude 2000–3000 ft. (Mann, Herb. Kew); 10 ft. in Toro, Uganda, altitude 4000 ft. (Dawe, Herb. Kew).

Randia maculata, *DC.*; Fl. Trop. Afr. III. p. 96.

Ill.—Salisbury, Parad. Lond. t. 65 (*Rothmannia longiflora*); Bot. Reg. (1845) t. 47 (*Gardenia Stanleyana*); Bot. Mag. t. 4185 (*Gardenia Stanleyana*); Fl. des Serres, t. 1 (*Gardenia Stanleyana*); Paxton, Mag. xiii. p. 169 (*Gardenia Stanleyana*); Belgique Hortic. xx. 1870, t. 4 (*Gardenia Stanleyana*); Rev. Hort. 1894, p. 60 (*Gardenia Stanleyana*); Garden, xxxviii. Oct. 1890, t. 773 (*Gardenia Stanleyana*); Gard. Chron. Oct. 3rd. 1896, p. 395 (habit); Rev. Hort. Belge, 1904, p. 5 (*R. Stanleyana*).

Vernac. names.—Buje (Yoruba, *Millson, Moloney*); Buji (Sierra Leone, *Scott Elliot*); Buje dudu, Asogbodum (Lagos, *Foster*); Gongoresi (Lagos, *Dawodu*).

Lagos; Yoruba, Abeokuta, Oshogbo; Nupe. Also in Fernando Po and in Uganda at Entebbe.

A dye is obtained from the fruit used by all interior tribes for tattooing the face blue, Yoruba (Millson, Kew, Bull. 1891, p. 208); for tattooing, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 51).

The plant is very decorative. A shrub 10–15 ft. (Fl. Trop. Afr. l.c.), 4–5 ft. Lagos (Foster, Herb. Kew); found at 3900 ft. though not common at Entebbe (Dawe, Herb. Kew).

Randia malleifera, *Benth.*; Fl. Trop. Afr. III. p. 98.

Ill.—Bot. Mag. t. 4307 (*Gardenia malleifera*); Fl. des Serres, t. 249 (*Gardenia malleifera*).

Vernac. names.—Buje-nla (Oloke-Meji, *Foster*); Blippo (Mombuttu, *Schweinfurth*).

Lagos; Insofan (Cross River); Agbemia (Niger), and widely distributed in West Africa from Sierra Leone to the Bagroo river, extending to the Sudan and Niam-Niam, and the Congo Region (Mombuttu).

The inky sap is used by the Niam-Niam and Mombuttu tribes to dye their skin (Schweinfurth, Heart of Africa, i. p. 199; Fl. Trop. Afr. l.c.; Moloney, For. W. Afr. p. 367), and the juice of the fruits is used for a similar purpose and also as ink by the natives in the region of the Bahr-el-Ghazal, White Nile (Brown, Herb. Kew). The seeds contain the dye when fresh only.

A handsome decorative plant. A puberulous shrub 8–15 ft. high or a small tree, Niam-Niam (Schweinfurth, l.c.); [flowers, brownish-white very fragrant, Agbemia, Niger (Barter); 3 ft. Oloke-Meji (Foster); flowers white, dirty yellow outside, except

white tips, Insofan (Holland); a large shrub, especially in dark localities near streams, Khor Telu, Sudan (Broun); a large shrub, Bahr-el-Ghazal (Brown); a shrubby tree 20 ft. in swamps, Akim, Gold Coast (Johnson); climber, Sierra Leone (Turner), common up to 3000 ft. Sierra Leone (Scott Elliot) Herb. Kew].

Randia nilotica, *Stapf* in Journ. Linn. Soc. xxxvii. (1906) p. 519.

[*R. dumetorum*, Hiern, Fl. Trop. Afr. III. p. 94, *non* Lam.]

Ill.—Schweinf. Fl. Aethiop. t. 3 f. 1 (*R. dumetorum*); Fiori, Piante Legnose Dell'Eritrea, p. 359, f. 170 (*R. dumetorum*); Agric. Col. 1911, Suppl. p. 136 (*R. dumetorum*).

Vernac. name.—Barbaji (Katagum, *Dalziel*).

Katagum (Dalziel, No. 298, 1908, Herb. Kew), Nile Region, extending to Brit. E. Africa.

Fruit said to act as a fish poison (Fl. Trop. Afr. l.c.) and an antidote to arrow poison, Katagum (Dalziel, l.c.).

[A shrub 10–15 ft., Nile Province, Uganda (Dawe, No. 882, 1905); a spiny shrub, Sudan (Muriel) Herb. Kew].

Randia octomera, *Benth.*; Fl. Trop. Afr. III. p. 98.

Ill.—Bot. Mag. t. 5410 (*Gardenia octomera*).

Old Calabar, collected by Rev. W. C. Thomson (1863) and Rev. H. Goldie (1888).

A decorative plant. The cultivation of this and all the Randias mentioned above is comparatively easy, from seed or cuttings, grown in moderately light soil rich in leaf mould or humus, and a fair proportion of sand.

Gardenia, Ellis.

Gardenia ternifolia, *Thunb.* in Schum. et Thonn. Beskr. Guin. Pl. p. 147.

Tree or shrub 6–15 ft. high, spreading, glabrous branches. Leaves oblanceolate or obovate, sessile, subacute or rarely rotundate, cuneate at the base $1\frac{1}{2}$–$3\frac{1}{2}$ in. long. $\frac{3}{4}$–$1\frac{1}{2}$ in. broad; subcoriaceous, glaucous on both sides, glabrous, with lateral nerves on each side 7–11 oblique. Flowers white or yellow, tubular. Fruit in section, oblong-elliptic 2–$2\frac{3}{4}$ in. long, $2\frac{1}{2}$ lin. diam. Seed subglobose, yellow, about 2 lin. diameter (*see* Stapf & Hutchinson, Journ. Linn. Soc. xxxviii. (1909) p. 425 for fuller description).

Vernac. names.—Gauden Kura (Katagum, *Dalziel*); Orumon or Oruwon (Oloke-Meji, *Dodd*).

Oloke-Meji (Dodd, No. 401, 1908, Herb. Kew); Nupe (Barter, No. 1205, Baikie (1862) Herb. Kew); Zungeru (Elliott, No. 30, 1904, Herb. Kew); Kuka, Bornu (Vogel, No. 92, Herb. Kew); Lake Chad and Bornu (Talbot, No. 271, 1911, Herb. Kew); Katagum (Dalziel, No. 162, 1908, and No. 161, fruit).

Fruit edible, but coarse (Dalziel, l.c.).

Gardenia Vogelii, *Hook. f.*; Fl. Trop. Afr. III. p. 103.

Ill.—Hook. Fl. Nigrit. tt. 38, 39; Hook. Ic Pl. tt. 782, 783.

Aboh in S. Nigeria; also in Sierra Leone.

Used in Djurland as a paint for the body (Moloney, For. W. Afr. p. 368).

A shrub, 8 ft. high, with white fragrant flowers, Aboh (Barter, Herb. Kew).

The *Gardenias* are in general very ornamental, and the cultivation is the same and as easy as that of the *Randias*. There are few of any further value, but among these may be mentioned (1) *G. lutea*, Fresen, known as "Abbak" and "Runda" in the Blue Nile region (Muriel, Herb. Kew), "Chü" in Golo, Bahr-el-Ghazal (Bröun, Herb. Kew), "Millaemathembo" and "Kotolah" in Madi (Grant, Trans. Linn. Soc. xxix. 1875, p. 85). The roots boiled with the flour of *Andropogon Sorghum* are taken by the natives as a cure for blackwater fever: the contorted thorny stems make an impenetrable fence (l.c.) and the fruit is edible (Broun, Herb. Kew). (2) *G. Jovis-tonantis*, Hiern; Fl. Trop. Afr. iii. p. 101; "Ndai," "Undai," "Dai," "Saie," etc., of Angola, an evergreen tree 5–8 ft. high, the wood of which is compact, heavy, and strong, recommended for all the purposes to which box-wood may be put (Hiern, Cat. Welw. Afr. Pl. ii. p. 461). (3) *Gardenia viscidissima*, S. Moore, is recorded as furnishing a useful wood on the Ivory Coast (Chevalier, Bois Côte d'Ivoire, p. 226).

None of these appear to have been observed in Nigeria, though they may occur there, being widely distributed in Tropical Africa.

Oxyanthus, DC.

Oxyanthus speciosus, *DC.*; Fl. Trop. Afr. III. p. 108.

Vernac. name.—Mule-mule (St. Thomé, *Welwitsch*).

Bonny River; Brass; Old Calabar. Also in Senegambia, Sierra Leone and St. Thomé.

The bark is dried and used for scent, by the natives of Sierra Leone (Lane-Poole, No. 115, 1912, Herb. Kew).

An ornamental shrub or tree, 12–20 ft. high.

Oxyanthus tubiflorus, *DC.*; Fl. Trop. Afr. III. p. 107.

Ill.—Andr. Rep. iii. t. 183 (*Gardenia tubiflora*); Bot. Mag. t. 1992 (*O. speciosus*); Lindley Collect. Bot. t. 13 (*O. speciosus*); Fl. des Serres, t. 737; Lemaire, Le Jard. Fl. iii. 1852-3, t. 245; Bot. Mag. t. 4636.

Lagos; Onitsha; Ibadan; Ilorin, and the Gold Coast, Bagroo River, St. Vincent, etc.

The fruit is beaten in a mortar and used for food (Moloney, For. W. Afr. p. 368; Fl. Trop. Afr. l.c.)

An ornamental plant introduced to England in 1789 from Sierra Leone (Andr. Rep. t. 183) and grown at Kew as *O. speciosus*, Aiton; a shrub, flowers white fragrant, Ibadan and Ilorin;

Onitsha (Barter, Herb. Kew), E. Akim, Gold Coast (Johnson, Herb. Kew). Propagated by cuttings and easily cultivated.

Morelia, A. Rich.

Morelia senegalensis, *A. Rich.*; Fl. Trop. Afr. III. p. 113.

[*Lamprothamnus Fosteri,* Hutchinson, Kew Bull. 1907, p. 49].

Ill.—Kotschy, Pl. Tinneana, t. 14.

Lagos (Foster, No. 4, 1906, Herb. Kew); Old Calabar (Mann, No. 2274, Herb. Kew); Nupe (Barter, No. 1180, Herb. Kew); Zungeru (Elliott, No. 25, 1904, Herb. Kew).

Used to stupefy fish, Nupe (Barter), Old Calabar (Mann).

A shrub, with fragrant white flowers, common on river banks, Nupe (Barter), flowers white tinged with pink, Zungeru (Elliott); a tree at Speki river, Lagos (Rowland, Herb. Kew).

Cremaspora, Benth.

Cremaspora africana, *Benth.*; Fl. Trop. Afr. III. p. 126.

Vernac. name.—Buje (Lagos, *Dawodu*).

Niger. Found also in Sierra Leone, Mombuttu, Bongo, Djurland and Zanzibar.

Fruits yield a blue colour like Indigo, W. Africa (Couper, Johnstone & Co. Mus. Kew). A pretty ornamental plant blossoming abundantly, Niger (Barter, Fl. Trop. Afr. l.c.); flowering and fruiting in Chirinde Forest, Gazaland, altitude 3700–4000 ft. Sept. to Dec. (Journ. Linn. Soc. xl. 1911, p. 87).

Plectronia, Linn.

Plectronia Afzeliana, *comb. nov.*

[*Canthium Afzelianum,* Hiern, Fl. Trop. Afr. III. p. 142.]

Ogbomosho, S. Nigeria, and in Sierra Leone.

The bruised bark is used by the natives as a cure for swollen legs (Fl. Trop. Afr. l.c.; Moloney, For. W. Afr. p. 368).

A much branched glossy shrub of moderate size (Fl. Trop. Afr. l.c.), 10–15 ft. high, common in the bush, Sierra Leone (Scott Elliot, Herb. Kew).

The fruit of *C. lanciflorum,* Hiern, is said to be one of the best in the country, collected by Kirk near Victoria Falls (Fl. Trop. Afr. iii. p. 146; but this species does not occur in Nigeria.

Plectronia glabriflora, *comb. nov.*

[*Canthium glabriflorum,* Hiern, Fl. Trop. Afr. iii. p. 140].

Vernac. names.—Nyankumati (Gold Coast, *Johnson*); Edie (Old Calabar, *Thomson*); Culmatamba? (Nigeria, Imp. Inst. No. 1, 1905, Herb. Kew); Aragbahi (Benin, Herb. Kew); Japan, Apam (Gold Coast, *Chipp*); Pao Formigo (West Africa, *Christy*).

Old Calabar; Benin. Found also in the Gold Coast, and extending to the Cameroons and S. W. Africa.

Wood brownish-white, of fine grain, somewhat like beech in hardness and working characters; said to polish well but of no ornamental or export value though useful locally; weight 34·6 lb. per cubic foot (Stone (1900) Mus. Kew). This specimen (Gold Coast, Johnson) now (1913) shows a specific gravity 0·555 = 34·6 lb. per cubic foot.

Found as a tree 40–50 ft. high; altitude 1000 ft., St. Thomé (Mann, Herb. Kew); of graceful palm-like habit, Old Calabar (Thomson, Herb. Kew); a small tree easily recognised when in flower by its strong disagreeable smell, Gold Coast (Chipp, Trees, Shrubs and Climbers, Gold Coast, p. 23).

Vangueria, Commers.

Vangueria Dalzielii, *Hutchinson* in Kew Bulletin, 1913, p. 179.

An erect shrub with terete branches covered with deciduous silvery bark; young one year old branchlets leafy, green, glabrous. Leaves opposite or 3–4–verticillate, sessile or shortly petiolate, obovate or elliptic-obovate, obtuse shortly and obtusely acuminate, slightly narrowed at the base, $1\frac{1}{4}$–2 in. long, about $\frac{3}{4}$–$1\frac{1}{4}$ in. broad, entire with a narrowly cartilaginous margin, glabrous on both surfaces, glaucous-green below; lateral nerves about 5 pairs oblique, slightly prominent; veins somewhat inconspicuous; stipules between the petioles, subulate-lanceolate from a broad base, obtuse, about 6 lin. long, long-pilose within the base. Flowers fasciculate at the nodes of the leafless parts of the branches; pedicels $2\frac{1}{2}$ lin. long, glabrous. Receptacle campanulate, glabrous. Calyx lobes 5, linear-lanceolate, subobtuse, 1 lin. long, glabrous outside, minutely puberulous within. Corolla tube straight, 6 lin. long, 3 lin. in diameter across the middle, glabrous outside or nearly so, with a dense ring of reflexed hairs below the middle inside; lobes 6, lanceolate, shortly apiculate, 6 lin. long, glabrous. Anthers included. Ovary 5-celled. Style shortly exserted, with a capitate cylindric stigma. Fruits 1–2-celled, subglobose or obliquely ellipsoid, about $\frac{3}{8}$ in. long, crowned by the persistent calyx-lobes.

Vernac. name.—Bi-ta-ka-tsira (Katagum, *Dalziel*).

Katagum, Northern Nigeria (Dalziel, No. 379, Herb. Kew).

A remedy for arrow poison (l.c.).

Vangueria edulis, *Vahl.*; Fl. Trop. Afr. III. p. 148.

Ill.—Agric. Col. 1911, Suppl. p. 139; Fiori, Piante Legnose Dell' Eritrea, p. 362, f. 173.

Vernac. names.—Munjiro (Chindao, Gazaland, *Swynnerton*); Voa-Vanga (Madagascar, *Nicholls*, *Moloney*); Muero (S. Africa, *Baines*); Mobero (B. E. Africa, *Elliott*).

Idda, Aboh. in S. Nigeria; distributed eastwards to the Bari Country, Uganda, B. E. Africa, and Madagascar.

Fruit edible—subglobose, about 1 in. in diam.; 4–5 seeded. Eaten by the natives of Madagascar and Mauritius (Moloney For. W. Afr. p. 368; Don. Hist. Dich. Pl. iii. p. 549).

Cultivated in India for its edible fruit (Dict. Econ. Prod. India).

A shrub, 8 ft. high, flowers green, Idda (Barter, Herb. Kew); small tree, Bari Country (Dawe, Herb. Kew); habit of coffee plant (Fl. Trop. Afr. l.c.); in flower December on the Lower Buzi, Chibabava, Gazaland (Swynnerton, Journ. Linn. Soc. xl. 1911, p. 91).

The native name "Munjiro" is applied to several species of *Vangueria, viz.* (1) *V. esculenta*, S. Moore, Journ. Linn. Soc. l.c., the "Chirinda Medlar," or the common "Munjiro of the Forest" —in flower September-October, fruit edible, bright gamboge in colour, falling from the trees in March and April, in Chirinda Forest, 3700–4000 ft. (Journ. Linn. Soc. l.c.). (2) *V. apiculata*, K. Schum. in Engl. Pflan. Ost. Afr. C. p. 384, the "Small White Medlar," common in long grass on the outskirts of Chirinda Forest, where it flowers in December (l.c. p. 93). (3) *V. infausta*, Burch. Trav. ii. p. 258, flowering October to December near Chirinda (l.c. p. 91). (4) *V. Munjiro*, S. Moore, l.c. p. 92, the "Common Munjiro" of Jihu, flowering in November, 2000 ft., Gazaland (l.c. p. 92).

Craterispermum, Benth.

Craterispermum laurinum, *Benth.*; Fl. Trop. Afr. III. p. 160.

Ill.—Hook. Ic. Pl. t. 1235.

Vernac. names.—Allam or Alum (Sierra Leone, *Schuchardt, Hummel*).

Widely distributed in West Africa—Senegambia, Sierra Leone, Gold Coast, Liberia, Bagroo River, extending to Gazaland and Beira in East Africa.

Bark beaten up with grass gives a yellow dye, River Bagroo (Mann, Herb. Kew) used for dyeing clothes, Sierra Leone (Scott Elliot, Herb. Kew; Hummel, Mus. Kew; Fl. Trop. Afr. iii. p. 161; Moloney, For. W. Afr. p. 369); leaves used for similar purpose, Sierra Leone (Schuchardt, Mus. Kew).

A shrub (Mann, l.c.), 5 ft. high Gold Coast (T.W. Brown, Herb. Kew); found in open woods at Beira, flowering October, fruiting December, altitude 4000 ft. near Chirinda (Journ. Linn. Soc. xl. 1911, p. 94); very common in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 31).

Coffea, Linn.

Coffea arabica, *Linn*; Fl. Trop. Afr. III. p. 180.

Ill.—Weinmann, Phytanthoza Icon. ii. t. 279, f.b.; Linné, Amoenitates Acad. vi. p. 160; Ellis, Monogr. Coffee tt. 1–2 (at end of work); Gaertner, Fruct. Sem. Pl. i. t. 25; Lam. Encycl. t. 160; Plenck, Ic. t. 130; Tuss. Ant. i. t. 18; Bot. Mag. t. 1303; Hayne, Darst. Beschr. Gewächse, ix. t. 32; Ness von Esenbeck, Plant. Medic. Düsseld. t. 257; Desc. Ant. viii. t. 564; Dict. Sc. Nat. t. 99; Drapiez, Herb. Amat. de Fleur. iii. t. 206; Geel, Sert.

Bot. ii.; Woodville, Med. Bot. i. (1832), t. 70; Steph. and Ch. Med. Bot. t. 182; Wight, Ic. Pl. Ind. Or. i. t. 53; Burnett, Pl. Util. i. t. 7a; Schnizlein, Ic. t. 127b; Spach, Suites (Hist. Nat. des Vegetaux), t. 63; Bedd. Fl. Sylv. (Anal. Gen.), t. 17 f. 1; Gard. Chron. July 22nd, 1876, p. 105 f. 27a (Berry of "Mocha"); U.S. Dept. Agric. Rep. 1878, p. 194, t. 2 (young plant); Bentl. and Trimen, Med. Pl. t. 144; Blanco, Fl. Filip. t. 53; Zippel, Ausl. Handels. Nährpfl. t. i.; Mart. Fl. Bras. vi. part 5, t. 11; Köhler, Med. Pfian. i.; Preuss. Expedit. Cent. und Südamer. p. 352 (habit, Nicaragua); Wettstein, Handb. Syst. Bot. p. 455, f. 435; Wettstein, Veg. Südbras. t. 40 (in plantation); Karst. and Schenck, Veg. bild. i. t. 15 (habit); De Wildeman, Mission E. Laurent, tt. 67–70; Teysmannia, Batavia, xviii. pp. 221 (var. *monosperma*), 224 (*angustifolia*), 225 (*rotundifolia*), 230 (*columnaris*); Freeman and Chandler, World's Comm. Prod. pp. 180, 193.

Vernac. names.—Murianbambe or Muria Nbambe (Golungo Alto, *Welwitsch*).—Arabian Coffee; Maragogipe Coffee; Mocha Coffee; Blue Mountain Coffee.

Probably native of Arabia; wild and cultivated in Abyssinia, Angola—in the more elevated primitive forests throughout Golungo Alto (Hiern. Cat. Welw. Afr. Pl. ii. p. 489). Widely cultivated in the Tropics, although in the East, owing to disease, it has been superseded by the stronger growing species *liberica* and *robusta*. Grown to some extent, on the Gold Coast, Brit. Cent. Africa, East Africa, Uganda—where in 1912 there were 2000 acres under cultivation covered by 20 estates under European control (Ann. Report, Uganda, Dept. Agric. 1912, p. 33).

Arabian coffee was being grown to a small extent in Lagos in 1894 and at the Botanic Station (a few feet only above sea level) and produced coffee valued at 94s. per cwt. in London. The Ilaro Estates and Plantations Co., Ltd., who commenced operations in 1892, had about 1000 plants at Soto in 1895, producing good crops of berries of good size (Kew Bull. 1896, p. 78), and Messrs. A. C. Campbell & Co., near Ajilete, had a few plants doing so well as to merit an extension of the plantation in this species (l.c. p. 79). On the Nikissi and Akpakka Plantations in 1900 only 1000 approximately were growing (*see* p. 36). At Oloke-Meji, a plot is reported as giving good results (Rep. Bot. Gdns. Oloke-Meji, May, 1907). At Old Calabar a few plants were grown from 1893, but in 1898 the annual report on the Botanic Gardens states that they were not satisfactory, probably owing to the low altitude. A variety, "Golden Drop," and also "Nalknad" Coffee, as grown in Bangalore, sent from the Royal Botanic Gardens, Kew, were planted out at Old Calabar in 1900.

This species has been recommended for cultivation in every West African Colony, on the hills of the interior (Kew Bull. 1890, p. 197). It is eminently suitable for altitudes that suit *Cinchona*, and as the country opens out, suitable localities, especially in Northern Nigeria, will probably be found for this plant.

The wood though small is hard and durable. In Golungo Alto it is used for furniture—chairs, tables, bedsteads, etc., and is suitable for turnery work (Hiern, l.c.).

C. arabica, var. *leucocarpa*, Hiern, with white berries is described from Sierra Leone (see Fl. Trop. Afr. iii. p. 181).

For particulars of cultivation, etc., see general information at end of the genus.

Ref.—The Coffee Planter of Saint Domingo, Laborie, pp. 1–145 (London, 1798): An abstract from this work, "Notes on Coffee from Laborie's Coffee Planter," pp. 1–8, on Situation, Cultivation, Pruning and Curing, has been published in Bull. Bot. Dept. Jamaica, ii. Dec. 1895, pp. 273-280.——Coffee and Chicory: Their Culture, Chemical Composition, Preparation for Market, and Consumption, Simmonds, pp. 1–102, illustrated (E. and F. N. Spon, London, 1864).——The Coffee Planter of Ceylon, Sabonadière, pp. 1–216, including Appendices of Description of the Coffee Tree by Laborie pp. 123–127; Extracts from Laborie's Remarks on Pruning, pp. 128–137, etc., etc. (E. and F. N. Spon, London, 1870); [An abstract of Sabonadière's work is published as "A Short Treatise on Coffee Cultivation," in Bull. Misc. Information, Roy. Bot. Gardens, Trinidad, No. 5, 1888, pp. 1–8].——Cultivo Del Cafe en la Costa Meridional de Chiapas, Matias Romero, pp. 1–240 (Imprenta del Gobierno en Palacio A Cargo De José Maria, Sandoval, Mexico, 1875).——"Coffee," in Trop. Agric. Simmonds, pp. 27–79 (E. and F. N. Spon. London, 1877).——Coffee Planting in Southern India and Ceylon: Being a Second Edition, Revised and Enlarged of "Coffee: Its Physiology, History and Cultivation," Hull, pp. 1–324, including an Appendix of "Instructions for the Medical Treatment of Coolies and others on Coffee Estates," . . . by Dr. R. S. Mair, pp. 313-324 (E. and F. N. Spon, London, 1877).——"*Coffea arabica*," in Med. Pl. Bentley and Trimen, No. 144, 9 pages (J. and A. Churchill, London, 1880).——"Maragogipe Coffee," in New Comm. Pl. and Drugs, Christy, No. 7, 1884, p. 79.——Coffee: Its Cultivation and Profit, Lester Arnold, pp. 1–270 (W. B. Whittingham and Co., London, 1886).—"*Coffea arabica*," in Med. Pflan. Köhler, i. 7 pages.——Reports from the Consuls of the United States, No. 98, Oct. 1888, pp. 1–143, including B. W. Indies—Jamaica, Trinidad, Spanish W. Indies—Cuba, Porto Rico, etc., Central America, Mexico and S. America.——"*Coffea arabica*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 460–491.——Memoria Sobre el Cultivo del Cafeto, Nicolas Saenz, pp. 1–65 (Bogota, Colombia, 1892).——"Coffee Enterprise in the East Indies," in Kew Bull. 1893, pp. 123–124.——"Coffee Cultivation in the New World," in Kew Bull. 1893, pp. 321–325.——"Coffee Husking in London," in Kew Bull. 1893, pp. 128–133.——Culture du Caféier, Raoul, avec la collaboration pour la partie commerciale de E. Darolles, pp. 1–249 (Aug. Challamel, Paris, 1894).——"Maragogipe Coffee," in Kew Bull. 1894, pp. 163–164.——Contribucion al Estudio del Cafe en Venezuela,

Dr. G. Delgado, Palacios, pp. 1–93 (Caracas, 1895).—— "Caféier: *Coffea arabica*," in Les Pl. Industrielles, Heuzé, iv. pp. 172–192 (Librairie Agric. de la Maison Rustique, Paris, 1895). ——Production of Coffee in Mexico, Crittenden, United States Cons. Rep. Washington, No. 192, Sept. 1896, pp. 103–121.——The Coffee Planter's Manual for both the Arabian and Liberian species, Ferguson, pp. 1–312 (Colombo, 1898; London office, 52, Gracechurch Street).——Coffee and India Rubber Culture in Mexico, preceded by Geographical Statistical Notes on Mexico, Matias Romero, pp. 1–417, "Coffee Culture on the Southern Coast of Chiapas," pp. 281–369 (G. P. Putnam's Sons, New York and London, 1898).——Le Café, Lecomte, pp. 1–342, with a bibliography pp. 333–335, illustrated (Georges Carré et C. Naud, Paris, 1899).——Kaffee—Düngungsversuche in Guatemala, Gustav Helmrich, [Sonderabdruck aus dem "Tropenpflanzer" (Organ des Kolonial-Wirtschaftlichen Komitees). v. No. 12, 1901] pp. 1–20.——"Coffee," in The World's Comm. Products, Freeman and Chandler, pp. 174–198, including Arabian and Liberian, illustrated (Sir Isaac Pitman and Sons, Ltd., London, 1907).——The Valorisation of Coffee in Brazil: A Lecture delivered on 29th January, 1907, before the Members of the Antwerp Society for the Study of Colonial Questions, Ferreira Ramos, pp. 1–208, illustrated (J. E. Buschmann, Antwerp, 1907).——Versuche über die Verwendung von Kunstdünger in der Kultur des Kaffees, Gustav Helmrich, [Sonderabdruck aus "Beihefte zum Tropenpflanzer, No. 4, 1908] pp. 1–36; with 12 figures in the text and 1 coloured plate: Translation "Manuring of Coffee: A Review of the Supplement to the Tropenpflanzer," No. 4, 1908, pp. 185–220, by G. Cowie, pp. 1–14 (Königl. Holbuchdruckerei, Wilhelm Greve, Berlin, 1908).——"*Coffea arabica*," in Comm. Prod. India, Watt, pp. 363–392.——"Culture et Commerce des Cafés en Abyssinie," Roux (Vice Consul de France), in L' Agric. prat. pays chauds, x. part 2, 1910, pp. 149-155.——"The Production of Mocha Coffee," in Agric. News, Barbados, x. 1911, p. 244.—— "A Costa Rican Coffee Estate," in The West India Comm. Circ. xxix, 1914, pp. 486–488.

See also References at end of the genus.

Coffea liberica, *Bull*; Fl. Trop. Afr. III. p. 181.

Ill.—Gard. Chron. July 22nd, 1876, p. 105, f. b (berry) c (leaf from seedling) e (leaf of an imported plant); U.S. Dept. Agric. Rep. 1878, p. 194, t. 1 (young plant); Ernst, El Café de Liberia, t. 1 (from Trans. Linn. Soc.); Christy, New Comm. Pl. and Drugs, No. 1, 1878, p. 1; Crüwell, Liberian Coffee, tt. 1, 2; Trans. Linn. Soc. i (1880) t. 24; Rev. Hort. 1890, pp. 104, 105; Wettstein, Handb. Syst. Bot. p. 454, f. 434; Koorders, Bot. Opmerk. v. Koffievruchten, p. 12; Karst. and Schenck, Veg. bild. i. t. 16 (fl. and fr.); De Wildeman, Mission E. Laurent, t. 104; Freeman and Chandler, World's Comm. Prod. p. 176 (plant in flower), p. 178 (in fl. and fr.), p. 185 (plant 3–4 years old in Java).

Liberian Coffee.

Native of West Africa—Liberia and S.W. Africa—Golungo Alto, Cazengo (Hiern, Cat. Welw. Afr. Pl. ii. p. 489). Widely distributed by cultivation in Trop. Africa, India, Ceylon, Madagascar, West Indies, Guiana, Surinam, East Indies, Java, etc.

This Coffee is usually considered inferior to Arabian, Robusta or Sierra Leone, but it makes up in vigour of the plant what it may lack in quality of the berry, and when well grown and properly prepared often realises as good a price as some of the presumably better varieties. Being a native of West Africa it thrives everywhere in suitable soil on the Coast from sea-level up to 2000 feet or more, and has been extensively introduced to many countries to replace Arabian where this has been killed out by disease. Plants raised from seeds, obtained specially from Liberia in 1874–76, were distributed from Kew to tropical botanical gardens throughout the Empire (Kew Bull. 1896, p. 77). It is now the principal kind grown in West Africa, and plantations have been established in the Western Province, at Soto, near the Ado River, commenced in 1892 by the Ilaro Estates and Plantations Company, Ltd. (Kew Bull. 1896, p. 78); at Ajilete [these plantations being the first in the Colony under European control (Kew Bull. 1893, p. 182; and 1896, p. 78)], on the Niger where (*see* p. 36), in 1900, approximately 140,000 plants were growing; at Ikotombo (Adiabo), Old Calabar River, and Eket, Quo Ibo, by the African Association (*see* p. 38); at Buguma, New Calabar District, by the Oil Rivers Company (*see* p. 39); and at Old Calabar. Plants have also been widely distributed to the Native Chiefs and Planters throughout the Colony.

Ref.—"The New Liberian Coffee," in Gard. Chron. July 22nd, 1876, p. 104.——Liberian Coffee in Ceylon: The History of the Introduction and Progress of the Cultivation up to April 1878, with information on the Soil, Climate and Mode of Culture best suited for the tree; Estimates of cost of opening a Plantation: References to Its Culture in Africa, India, The West Indies, etc., and a Series of Letters on Liberia by the late Mr. G. A. Crüwell who visited W. Africa in 1874: Compiled from the Columns of the Ceylon Observer, pp. i.–xxxvi. and pp. 1–177, A. M. and J. Ferguson (Colombo, 1878).——"The New Liberian Giant Coffee, *Coffea liberica*," in New Comm. Pl. and Drugs, Christy, No. 1, 1878, pp. 1–7.——El Café de Liberia en Venezuela, Ernst, pp. 1–8 (Caracas, 1878).——On the Cultivation of Liberian Coffee in the West Indies, Nicholls, pp. 1–31 (S. W. Silver and Co., London; office of the Colonies and India, 1881).——Notes on Liberian Coffee: Its History and Cultivation, Morris, pp. 1–14 (Botanical Dept. Jamaica, 1883).——The Cultivation of Liberian Coffee, Nicholls, pp. 1–22, reprinted from "Timehri" (Demerara) iii. part 2, 1884.——"Liberian Coffee (*Coffea liberica*)," in Kew Bull. 1890, pp. 107–108 and pp. 245–253.——"Liberian Coffee in the Malay Native States," l.c. 1892, pp. 277–282.——"Pulping Liberian Coffee," l.c. 1893, pp. 204–206.——"*Coffea liberica*," in Col. Rep. Misc. No. 3, 1893, pp. 15–17.——"Liberian Coffee," in Bull. Bot. Dept. Jamaica, i. 1894, pp. 1–14, with figures and

descriptions of pulpers.——"Liberian Coffee," l.c. ii. 1895, p. 145.——"Liberian Coffee," in Bull. Misc. Information, Roy. Bot. Gardens, Trinidad, July 1894, pp. 267–273.——"Liberian Coffee," Kew Bull. 1895, pp. 273–274, including an Extract from Proc. of the Agri.-Hort. Soc. Madras, April-June, 1895.——"Liberian Coffee," in Kew Bull. 1895, pp. 296-299, Letter Messrs. Major and Field to Director, Kew, relating to cleaning, husking, sizing, etc., in London.——"Coffee Planting in Lagos," l.c. 1896, pp. 77–79, including some information on Arabian.——"Coffee Cultivation at the Gold Coast," l.c. 1897, pp. 325–328, value and general charges of sale, etc., with some information on Arabian.——The Cultivation of Liberian Coffee: A Pamphlet on the Opening up and Management of a Liberian Coffee Estate in the Malay Peninsula, Hüttenbach, pp. 1–59, with plans: reprinted from the Selangor Journal (Selangor Gov. Press, Kuala Lumpur, 1897).——"De Achteruitgang van de Liberia Koffie op Java: Welke Houding Moeten Wij Tegenover Haar Aannemen," Cramer, in Teysmannia, xviii. 1907, pp. 762–780. See also The Coffee Planter's Manual, Ferguson, under *C. arabica*, and references at end of genus.

Coffea robusta, *Linden*, Cat. Pl. Econ. Col. L'Hort. Col. Bruxelles, p. 64; Kew Bull. 1901, App. iii. p. 88.

A small tree 10–20 ft. high. Branches stout, terete, glabrous. Leaves large, oblong-elliptic, obtusely cordate-acuminate, rounded at the base, up to 10 in. long and 6 in. broad, chartaceous, dull on both surfaces, glabrous; midrib flat above, prominent below, lateral nerves 9–12 on each side, looped and much branched within the margin, slightly arcuate, diverging from the midrib at an angle of 45°, distinct above, prominent below, veins lax; petiole $\frac{1}{2}$ in. long, glabrous; stipules interpetiolar, broadly triangular, long-mucronate, 3–4 lin. long, about 4 lin. broad. Flowers in dense axillary clusters, about $1\frac{3}{4}$ in. in diameter, often with a few small leaves intermixed. Calyx minute, entire. Corolla 5–merous; tube about 5 lin. long. Anthers exserted, 5 lin. long, slightly twisted when dry. Berries, about $\frac{1}{2}$ in. in diameter, size of *arabica* and *stenophylla* or about half the size of *liberica*, outer skin thin, 2-seeded, cherry-like when ripe. *Coffea Laurentii*, Wildem. in Compt. Rend. Congr. Intern. Bot. (1900) p. 234.

Ill.—Gard. Chron. May 16th, 1903, p. 306 (*C. Laurentii*); Cat. Pl. Hort. Col. Bruxelles, p. 65; India Rubber Journ. June 13th, 1910, p. 791, f. 1 (tree in full flower), f. 2 (tree $2\frac{1}{4}$ years old, in fruit, Sumatra, grown without shade), p. 792, f. 3 (plants 9 months old, intermixed with Para rubber 10 months old, United Serdang Plantation); Cramer, Bull. Soc. Belge d'Etudes Col. xxiii. 1911, p. 109 (habit).

Robusta Coffee, Rio Nunez Coffee, Congo Coffee.

Native of the Congo. Widely distributed by cultivation in Tropical Africa—in Uganda 65 acres were reported under cultiva-

tion in 1912 (Ann. Rep. Dept. of Agric. Uganda, 1912, p. 33); in Java, Sumatra, Trinidad.

This species was collected in the Congo and described in 1900, its value under cultivation appears to have been first realised in Java whence seeds were sent from Brussels in 1900, and where it now occupies some thousands of acres largely interplanted with Para Rubber (*Hevea brasiliensis*). It has been sent out from Kew to most of the Colonial Agricultural Departments including Nigeria. A plant in the Botanic Gardens, at Entebbe, Uganda, received there in 1901 as a seedling, was 5 feet high, May 1903 (Gard. Chron. 16th May, 1903, p. 306). In Ceylon it has been reported (Adm. Rep. 1907, Roy. Bot. Gdn. p. C11) that "The New Congo Coffee (*Coffea robusta*) does not by its behaviour here as yet justify an extension of its cultivation. It bears large handsome leaves, but at best yields only a very light crop of small berries." The quality of the berries appears to be about equal to that of the Arabian and the habit of the plant as robust as that of the Liberian Coffee, and like the latter it is well adapted to growing at low elevations, from sea-level up to 2000 feet or more.

For particulars of cultivation see end of genus.

Ref.—"Robusta Coffee," in Journ. Bd. of Agric. British Guiana, iii. No. 3, 1910, pp. 166–167.——"The Congo Coffee Plant," in Agric. News, Barbados, ix. 1910, p. 133.——Coffee Robusta, Gallagher, Dept. of Agric. Fed. Malay States, Bull. No. 7, 1910, pp. 1–7.——"Une Nouvelle Culture Intercalaire pour les Arbres a Caoutchouc De Para: Le Café Robusta," Cramer, in Bull. de la Société Belge d'Etudes Coloniales, xviii. Feb. 1911, pp. 101–117; Abstract in The India Rubber Journ. June 13th, 1910, "Coffee Robusta as a catch crop for Para Rubber," pp. 791–792, and in the Agric News, Barbados, x. 1911, "*Coffea robusta* in Para Rubber Cultivation," pp. 132–133, reprinted as Cope's Planting Leaflet, No. 1, 1912, pp. 1–7 (Stuart R. Cope, 33, Gt. Tower St., London).——"Robusta Coffee," in Bull. Imp. Inst. x. 1912, pp. 454–465.——"Etude sur le *Coffea robusta*," De Wildeman, in Bull. de L'Assoc. des Planteurs de Caoutchouc, iv. No. 12, Dec. 1912, pp. 274–276, v. No. 2, Feb. 1913, pp. 28–31.

Coffea stenophylla, *G. Don*; Fl. Trop. Afr. III. p. 182.

Ill.—Bot. Mag. t. 7475; Kew Bull. 1896, p. 190; Hart. Ann. Rep. 1897, Roy. Bot. Gardens, Trinidad, p. 14; De Wildeman, Mission E. Laurent, tt. 62, 64; Teysmannia, Batavia, xviii. 1907, p. 292, f. 15, ff. 16–17 (Hybrids, *C. stenophylla* × *C. liberica*).

Highland Coffee of Sierra Leone; Bush Coffee (Sierra Leone).

Native of West Africa, first known from Sierra Leone, where it is cultivated in preference to Liberian (Kew. Bull. 1896, p. 189). Introduced to the West Indies, Ceylon, India, and sent to Botanic Stations in all the Colonies from Kew, the distribution beginning about 1895, the plants from seeds specially collected by the

Government of Sierra Leone, in 1894. A supply of seeds from Sierra Leone was received at Old Calabar in January 1897, the plants raised were reported in 1898 to be growing vigorously (Ann. Rep. Bot. Gardens, Old Calabar, MSS.).

The berry is a small one; described of superior quality equal to "Mocha." Although the species is called Highland Coffee it thrives with the Liberian, but would also succeed at altitudes approaching those more suitable for Arabian.

Wood used for walking-sticks, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 35).

Ref.—"Highland Coffee of Sierra Leone (*Coffea stenophylla*)," in Kew Bull. 1896, pp. 189–191.

Coffee as a beverage is well known; it was one of the earliest introduced to this country, the first London coffee-house being established in St. Michael's Alley, about 1652. It had been used in Constantinople for more than a century before.

The four species above mentioned are those commonly cultivated, and their requirements are approximately similar. *C. arabica* will not succeed below about 1500 ft. with a range up to about 5000 ft., but *C. liberica*, *C. robusta*, and *C. stenophylla* succeed best from sea level up to 2000 feet, though they may thrive up to 5000 feet, the effect of the higher elevations has a tendency to improve the quality of the berry and to reduce the vigour of the plant. The principal requirements otherwise are rich, deep, loamy soil, open subsoil with thorough drainage, good and regular rainfall—50–100 inches—and a sheltered position. It may also be necessary to plant shelter belts of suitable trees.

For propagation the richest and finest fruits should be selected, and the seeds must be sown in prepared nursery beds as soon as possible after the removal of the pulp. They are usually placed the flat side downwards, about 3 or 4 inches apart and 1–1½ inches below the surface of the soil. Germination takes place in a month or six weeks and the seedlings should be ready for planting out in permanent positions in from 10–12 months; if sown about September towards the end of the rainy season they would be ready for transplanting the following July in time to get established before the following dry season. Plants may also be conveniently raised in Bamboo pots. Light shading is necessary during the hot season in the nursery, and careful watering; temporary shade of a few palm leaves is beneficial round each plant after transplanting.

Permanent shade trees may or may not be necessary, but for *C. arabica* at the lower elevations it will probably be required in all cases. Bananas, Plantains or "Pigeon Pea" (*Cajanus indicus*), are suitable for shade purposes when the plants are young, and later large growing trees will be needed. In Colombia the "Guamo Rabo di Mico" (*Inga laurina*) is generally used (Cons. Rep. Ann. No. 3114, 1904, p. 9) known as "Poix doux" in the West Indies, and also "Jack tree" (*Artocarpus integrifolia*)

(Agric. News, Barbados, 1904, p. 89); the "Rose Apple" (*Eugenia Jambos*), *Erythrina* spp., or any of the trees mentioned under Cacao (*see* p. 98) are recommended. The same trees may also be planted as shelter belts. Liberian Coffee and Highland Coffee require little or no shade. Robusta Coffee in Java is grown under shade (Cramer). In Brazil (Arabian) and Jamaica (Blue Mountain) the plants are grown without shade.

The distances apart of the shade trees must be regulated according to situation, size of tree and in proportion to the space between the coffee trees all the species mentioned requiring 8 × 8, 10 × 10, or 12 × 12 ft.

If left to themselves the coffees would grow from 15–30 ft. high, but in practice they are usually kept topped to about 5 or 8 feet for convenience in gathering the fruit. In pruning the object is to encourage as much young wood as possible and an open centre. Suckers (so called, since true suckers arise from the root) growing from the main stem have a tendency to fill up the centre, and must be regularly removed by pulling or tearing off, not cutting, when young; all cross branches should be cut out and the primary, secondary and tertiary branches encouraged to grow horizontally, and as far as possible clear of each other.

The trees begin to bear fruit after about 3 or 4 years, and the berries ripen in about 10 months from the time of flowering. No definite period can be stated for harvesting as the berries are ripening nearly the year round, but the most important collections will be in the dry season. They should be gathered as soon as ripe especially those of Arabian which are liable to drop; the berries of Liberian and Robusta do not drop so readily, and probably picking monthly would be found sufficient.

The berries are pulped as soon as possible after gathering, the beans being placed in a barrel or other receptacle to ferment in order to remove the mucilaginous material with which they are covered. When the mucilage comes off readily (after about 24 hours) the beans are washed and put to dry on trellises or mats in the shade or moderate sunshine, with some convenience for protection from rain. When thoroughly dry they are put into bags, usually containing about 132 lb. and the coffee is ready for shipment. This is "parchment" coffee and the question of the advisability of shipping it in this form depends largely on local conditions, but it is generally the best method, it saves labour and "hulling" machinery on the plantation, the "parchment" covering serves to protect the bean during transit, and the whole cost of landing, husking, sizing, etc., is very moderate at 2s. 6d. per cwt. The advantages generally are fully discussed in Kew Bulletin, 1893, pp. 130–133 by Messrs. Major and Field, the originators of "Coffee Husking in London." Drying and shipping in the berry is not profitable. The "parchment" coffee in the course of treatment is graded by means of specially regulated sifters as to dimensions into "Bold," "Large Medium," "Small Medium," "Smalls," "Bold Pea-berry," "Small Pea-berry," "Triage"

(broken) and "Elephant" or overgrown; and an example shown at the time of a visit made by the writer to the above mentioned establishment in 1897 turned out for 58 bags as follows: 14, 28, 7, 9 and 2 cwt.; 2 qrs., 1 cwt. 2 qrs., and 15 lb. respectively. The commercial forms are usually distinguished according to the country of origin, as "Brazil," "Costa Rica," "Mocha," "East India," "Mysore," "Java," "Liberia," etc.

The yield may vary from about 2 cwt. to 20 cwt. per acre. In India for *C. arabica* it has been given at from 2–10 cwt. (Watt); a pound per tree, a very good average (Nicholls); in the State of San Paulo, Brazil, 50 kilogrammes of coffee are produced by about 70 plants, and the cost of production—cultivation, gathering, preparation, etc., is estimated at about 36 francs (Ramos, Valor. Coffee, Brazil, p. 10); in Java for *C. robusta*, 1½ cwt. per acre at 2 years, increasing to 17 cwt. at 5 years old, the trees planted 12 ft. by 12 ft. with a tree in the centre of the square (Cramer); 16–60 pikuls per bouw [about 2241 lb. per 1¾ acres] (De Wildeman): 1 pikul nearly [about 135 lb.], 6 pikuls [about 810 lb.], 14 pikuls [about 1890 lb.] and 14 pikuls per acre, trees 10 ft. by 10 ft. with 45 nutmegs taking the place of coffee, that is 390 coffee plants to the acre in the 2nd, 3rd, 4th and 5th years respectively (Gallagher); in the West Indies for *C. liberica*, 1–8 lb. of clean coffee per tree (Nicholls), and *C. stenophylla* appears to yield equally freely.

It has been calculated that on an average 10 pikuls [about 1350 lb.] of Liberian berry give one pikul [about 135 lb.], and 4 pikuls [about 540 lb.] of Robusta berry give the same amount of market coffee, (Gallagher, Dept. of Agric. Fed. Malay St. Bull. No. 7, 1910, p. 1).

The total imports of coffee into the United Kingdom during 1910, were 936,778 cwt. value £2,303,014—797,087 cwt. value £1,866,589 coming from Foreign Countries, chiefly Brazil (358,900 cwt. value £661,555) followed in order of importance for that year by Costa Rica, Guatemala, Colombia, Nicaragua, Mexico, San Salvador, Portuguese Possessions in India, French Somaliland, Turkey (Asia), Java, Venezuela, Ecuador, Honduras (not British), Peru, Liberia, Chile, Panama, etc.—139,691 cwt. value £436,425 from British Possessions, chiefly British India (118,484 cwt. value £369,999), B.W. Indies, Aden and Dependencies, Nyasaland Protectorate, British Guiana, E. Africa Protectorate, and other British Possessions not defined (Trade of the United Kingdom, i. 1911, p. 208). The price per cwt. at the present time (March, 1913) is 72s. 6d. to 85s. for Costa Rica and 72s. to 83s. 6d. for East India; 71s. 6d. to 83s. for Jamaica (Dec. 1912, West India Comm. Circ.) in London; 15c. per lb. for Venezuelan in Trinidad; 17c. to 19c. per lb. for "Creole"; 20c. to 21c. per lb. for Jamaica and Rio; 14c. to 16c. per lb. for Liberian in British Guiana (Agric. News, Barbados, 1913, p. 32). The total exports from Nigeria (selecting figures for 1910 for better comparison with the general trade as above) were 249 cwt. value £360 made up by exports from the Western Province (198 cwt. value. £295), the

Eastern Province (44 cwt. value £50), and the Central Province (7 cwt. value £50) S. Nigeria, all with the exception of 32 cwt. value £47 (included in the W. Prov. figures) destined for the United Kingdom (Govt. Gaz. S. Nigeria, May 17th, 1911, Suppl. Appendices B i., B ii., and B iii.), doubtless included in the returns for "other British Possessions" referred to above, and apparently the greater proportion, as the total from these sources only amounted to 344 cwt. value £715.

In connection with the Brazilian imports to this country, it may be mentioned that during the same year (1910) the total exports from Sao Paulo, the principal coffee growing State amounted to 9,500,000 bags (Cons. Rep. Ann. No. 4700, 1911, p. 3) under limitations of the *valorisation described below. Calculating 60 kilogrammes to the bag we have 11,221,875 cwt. approx. or 10,862,975 cwt. more than came into this country. Without submitting these figures no just estimate of the importance of the coffee trade could be formed, and to draw a final conclusion the local exports from all the countries mentioned, together with the production, should be given. Further information may be obtained from the numerous works on the industry mentioned in the references appended.

Ref.—"On the African Species of the genus *Coffea*," Hiern, in Trans. Linn. Soc. 2nd series, i. 1880, pp. 169–176.——From Coffee Plantation to Cup: A Brief History of Coffee Production and Consumption, Thurber, pp. 1–416 (American Grocer Publishing Assoc. New York, 1881).——"Koffie" in Beschrijvende Catalogus Tevens Handleiding tot de Kennis der voortbrengselen van de Neerlandsche Overzeesche Gewesten, No. 1, 1882, van Gorkom, pp. 1–54 (Koloniaal Museum, Haarlem).——Brazil and Java: Report on Coffee-Culture in America, Asia and Africa, van Delden Läerne, with plates, maps and diagrams, pp. 1–637 (W. H. Allen and Co., London: Martinus Nijhoff, The Hague, 1885). ——Coffee: Its Cultivation and Profit, Arnold, pp. 1–270 (Whit-

* The scheme was in effect a trust or corner in coffee to limit the sale in order to keep the price up to a profitable standard, made under the guarantee of the Federal Government, and ratified in the Taubaté Treaty in February, 1906, by the Presidents of Sao Paulo, Minas Geraes and Rio de Janeiro. It was urged by the planters and bankers of the country (to whom most of the estates had been mortgaged), and ended in a loan of £15,000,000, raised in Europe, with the balance of the coffee acquired under the conditions, and, in the early stages of the scheme, amounting to nearly 7,000,000 bags as security. The interest and redemption was provided for in a surtax of 5 francs per bag of coffee exported. This stock had been purchased by means of previous loans amounting to £8,000,000, and the system was rendered abortive for want of further funds, more surplus coffee being produced than it was possible to buy or sell without unduly disturbing the market. The situation is now being met by prohibitive duties on all coffee exported above a certain amount—10,000,000 bags in 1910–11 (Cons. Rep. Ann. No. 4700, p. 17); the trustees of the new loan are also limiting the annual sale of their security, or "Valorisation Coffee"—600,000 bags in 1910–11 (l.c.), or according to the requirements of the market, and finally, the Sao Paulo Government is endeavouring to increase the demand by advertising the coffee throughout the world.

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London and New York, 1907).——Coffee from Grower to Consumer, Keable, pp. 1–168 pl. 1, figs. 22 and 1 map (London 1909).——"Café," E. Charabot, in L'Agric. prat. pays chauds, viii. part 1, 1908, "Les Productions Végétales des Colonies Françaises," pp. 448–458, "Cafeier d'Arabie," pp. 448–450; "Cafeier d'Liberia," pp. 450–458.——"Café," De Wildeman, in Ann. L'Inst. Col. Marseille, vii. 1909, pp. 317–323.——Le Cafe dans L'Etat de St. Paul (Brésil), A. Lalière, pp. 1–417 (Augustin Challamel, Paris, 1909).——"Coffee from the East Africa Protectorate and Rhodesia," in Bull. Imp. Inst. viii. 1910, pp. 365–369.——"Present condition of the Coffee Market" and "The Valorization Scheme," in Dip. and Cons. Rep. Ann. No. 4700, 1911, pp. 14–18.——"The Production of Coffee in Brazil," in Journ. Roy. Soc. Arts, lxi. 1913, pp. 449–451.——"Coffee," in Planting in Uganda: Coffee—Para Rubber—Cocoa, Brown and Hunter, pp. 1–176 illustrated (Longmans, Green and Co., London, 1913).——"Coffee Cultivation in Uganda," Small, in Bull. Imp. Inst. xii. 1914, pp. 242–250.—"The Cultivation and Preparation of Coffee," l.c. xiii. 1915, pp. 260–296.

Morinda, Vaill.

Morinda confusa, *Hutchinson* in Kew Bull. ined.

[*M. longiflora*, Hiern in Oliv. Fl. Trop. Afr. iii. p. 192, partly].

A scandent shrub, fruits deep orange colour when ripe (Barter); a climber, flowers white, fragrant (Johnson).

Closely allied to *M. longiflora*, and confused with that species in the Flora of Tropical Africa; easily recognised from the remaining species by the terminal *solitary* pedunculate heads; corollas stout and usually short, straight in bud.

Vernac. names.—Ogidogbo, Ojuologbo, Ogioloba (Sierra Leone, *Scott Elliot, Holmes, Cole*); Ojuologbo (Nigeria, Imp. Inst. No. 6, 1905, Herb. Kew); Humidtaradu (Arabic, *Cole*).

Lagos (Millen, No. 168, Herb. Kew), Eppah (Barter, No. 3272, Herb. Kew), Nigeria (Imp. Inst. No. 6, 1905, Herb. Kew).

Occurs from Sierra Leone to Angola and in the Niam-niam country of North East Tropical Africa.

Used as a native medicine for fever, Sierra Leone (Scott Elliot, Herb. Kew; Col. Rep. Misc. No. 3, 1893, p. 57, *M. longiflora*), and by nearly all the West African tribes (Cole, Journ. Soc. Arts. liii. 1905, p. 1069, "Ojuologbo—woody vine") and said to be one of the most valuable plants as a remedy for malarial fever, and to possess other medicinal virtues (Cole, l.c., Holmes, Pharm. Journ. [4] xxx. 1910, p. 50; Pharm. Mus. Rep. 1907–10, p. 62, *Morinda longiflora*). Ogiologbo root is much used as fever medicine both by Europeans and Natives, Sierra Leone (Scott Elliot; Burroughs and Wellcome, Mus. Kew).

Ref.—Chemical Examination of the Root and Leaves of *Morinda longiflora*, Barrowcliff and Tutin, No. 77, Wellcome Research Laboratories, London.

Morinda geminata, *DC.* Prodr. iv. (1830), p. 447; [*M. citrifolia,* Hiern in Oliv. Fl. Trop. Afr. iii. p. 191, partly, *non* Linn.; *Psychotria chrysorhiza,* Schum. & Thonn. Pl. Guin. p. 111? *Morinda macrophylla,* Desf. Cat. Hort. Par. ed. 3, p. 404; *M. chrysorhiza,* DC. Prodr. iv. p. 450?; *M. quadrangularis,* G. Don, Syst. Veg. iii. (1834) p. 545].

A tree with conspicuously quadrangular branchlets and very stout peduncles; flowers white; distinct from the Indian *M. citrifolia,* L., with which it has been confused.

Vernac. names.—N'Salagui (Sierra Leone, *Lane Poole*); Bungbo or Bumbo (Sierra Leone, *Scott Elliot*); Ojuologbo (Sierra Leone, Imp. Inst. No. 8, 1906, Herb. Kew).—Brimstone Tree of Sierra Leone (Barter).

Sierra Leone—the only region in West Africa where this species is known to occur, but it is included here because of the previously mistaken association with *M. citrifolia,* of the Flora of Tropical Africa.

A native medicinal plant of Sierra Leone (Imp. Inst. l.c.), the leaf forms a very good purge (Scott Elliot, No. 5278, Herb. Kew), and the roots are cut up and mixed with indigo plant to bring out the colour, Sierra Leone (Lane-Poole, No. 152, Herb. Kew).

The wood is used for flooring, said to resist insects, Sierra Leone (Barter, Herb. Kew), for house work and ordinary purposes, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 35, "Brimstone," *M. citrifolia*).

Morinda longiflora, *G. Don,* Gen. Syst. iii. p. 545; [Hiern in Oliv. Fl. Trop. Afr. iii. p. 192, partly].

A climbing free-flowering shrub up to 10 ft. high; readily distinguished from the other African species by the terminal paired peduncles supporting the flowers; corollas slender and curved in bud. Flowers fragrant. Calyx green. Corolla white (Johnson) or copper-coloured (Barter).

Vernac. names.—Leverek beni and Benti (Sierra Leone, *Lane Poole*).

Occurs from Sierra Leone to the Cameroons and in the island of Fernando Po; has been collected in the Eket district, Southern Provinces, by Mr. and Mrs. P. A. Talbot (No. 3255).

Morinda lucida, *Benth.* in Hook. Niger Flora, p. 406. [*M. citrifolia,* Hiern in Oliv. Fl. Trop. Afr. iii. p. 191, partly, *non* Linn. *M. citrifolia,* var. *lucida,* Hiern in Cat. Afr. Pl. Welw. ii. p. 492].

A large straight-boled tree, Uwet (MacLeod), 30–40 ft. high, Cross River (Holland), 15–20 ft. high, trunk 1–3 ft. in diameter, flowers abundant, white, fragrant, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 492), distinguished from the other African species by the terete branchlets and the small flowering and fruiting heads supported on extremely slender peduncles; it is

also distinguished by these characters from the Asiatic and Malayan *M. citrifolia*, L., with which it was confused in the Flora of Tropical Africa.

Vernac. names.—Eruwo or Eruwaw (Yoruba, *Millson, Moloney*); Oruwo (Oloke-Meji, *Foster*); Guigo (Princes Island, *Welwitsch*); N-golo-mugi (Angola, *Welwitsch*).—Brimstone (Nigeria, Imp. Inst. No. 8, 1905, Heb. Kew), Brimstone Wood (Yoruba, *Millson*).

Gold Coast to Angola and in North East Tropical Africa; confined to the Southern parts of Nigeria—Yoruba, Lagos (Millen No. 106, Herb. Kew; Millson, Herb. Kew); Abeokuta (Irving, No. 70, Barter, No. 3388, Herb. Kew), Onitsha (Barter, Nos. 1234, 1753, Herb. Kew); Uwet (MacLeod, Herb. Kew); Inkum, Ekom Cross River (Holland, No. 240, Herb. Kew).

Used by the natives in dysentery and fever, Onitsha and Fernando Po (Barter, l.c.), tonic leaf, Yoruba (Millson, l.c.), a yellow dye is obtained from the tree Uwet (MacLeod, l.c.).

The timber is used for building huts in Golungo Alto (Hiern, Cat. Welw. Afr. Pl. ii. p. 492), for canoes, planks, posts, etc., resisting ravages of termites, Yoruba (Millson, Kew Bull. 1891, p. 211, *M. citrifolia*); one of the most valued woods in West Africa, for all kinds of carpentry work, very durable underground and in damp situations, not liable to attacks from insects (Mann, Mus. Kew); specific gravity 0·593 to 0·632 (Chevalier, Bois, Cote d'Ivoire, in Les Veg. Util. L'Afriq. Trop. Franç. Fasc. v. p. 228, *M. citrifolia*), and according to a specimen (Mann, Cameroons) in the Kew Museum 0·806 = 50 lb. per cubic foot. This specimen was cut from a tree 8 inches in diameter, bark $\frac{1}{8}$ in. thick, fibrous, colour of the wood yellow, darkening by exposure, hard, close grained.

Psychotria, Linn.

Psychotria Ipecacuanha, *Stokes*, Bot. Mat. Med. I. p. 365. [*Cephaelis Ipecacuanha*, A. Rich., Hist. Nat. Ipecac. (1820) p. 21].

A low shrub, about 18 in. high. Roots more or less creeping horizontally, annulated, in commercial specimens, about $\frac{1}{8}$ in. in diameter. Stem erect, woody, sometimes branching. Leaves opposite, oval or elliptic, somewhat acuminate. Inflorescence a capitulum; flowers white, fragrant, set in a 4-leaved involucre.

Ill.—Trans. Linn. Soc. vi. (1802) t. 11 (*Callicocca Ipecacuanha*); [Plenck, Ic. t. 754; Hayne, Darst. Beschr. Gewächse, viii. t. 20; Martius, Med. Pl. Bras. t. 1, t. 8, ff. 1–3 (roots); St. Hil. Pl. Us. Bres. t. 6; Nees von Esenbeck, Plant Medic. Düsseld. t. 258; Giumpel, Abbild. Beschr. t. 43; Woodville, Med. Bot. iii. (1832), t. 274; Steph. and Ch. Med. Bot. t. 62; Bot. Mag. t. 4063; Burnett, Pl. Util. iv. t. 106A; Pereira, Mat. Med. ii. (1853) p. 1591, f. 321; Berg. and Schmidt, Darst. Beschr. Pharm. ii. t. 15c; Trans. Roy. Soc. Edinburgh, xxvi. 1872, tt. 31, 32; Trans. Bot. Soc. Edin. x. t. 4; Rev. Hort. 1873, p. 275; Bentl. and Trimen, Med. Pl. t. 145; Köhler, Med. Pflan. i.; Zippel, Ausl. Handels Nährpfl. t. 26

(*Cephaelis Ipecacuanha*)]; Mart. Fl. Bras. vi. pt. 5, t. 52; Jacquemet, Ipecacuanha, tt. 2, 4; Moeller, Pharmakog. Atlas (Berlin, 1892) t. 103 (Radix Ipecacuanha); Planchon and Collin, Drog. Simpl. ii. p. 166 (*Cephaelis Ipecacuanha*); Chemist and Druggist, Oct. 19, 1912, p. 49 (Root "Johore").

Ipecacuanha. Poaya (Brazil). It may be mentioned that "Poaya" as a general name for plants with emetic properties is also applied to several spurious Ipecacuanhas including *Psychotria emetica* (striated or "black" Ipecacuanha), *Richardsonia pilosa* (undulated or white Ipecacuanha) and *Ionidium Ipecacuanha* (*Violarieae*), all of which have come into commerce at various times as substitutes or as adulterants.

Native of Brazil. Cultivated in Straits Settlements.

The root, under the name of "Ipecacuanha" is an important article of commerce, for medicinal purposes.

The value at the present time is for "Matto Grosso," nominally 8s. 9d.; "cultivated Minas," 8s. 3d. to 8s. 4d. per lb. (Chemist and Druggist, Jan. 18th, 1913, p. 95), "Johore" 6s. 9d. (l.c. Feb. 8th, 1913, p. 241) to 8s. per lb. and "Cartagena" 7s. 6d. to 8s. 2d. (l.c. Feb. 15, 1913, p. 279).

Collection from well-established plants may go on nearly the year round. Drying in the sun or under cover in rainy weather is all the preparation required, and it may occupy only a few days before packing for export. The total imports into this country amount to upwards of 100,000 lb.

The cultivation of this plant appears to be somewhat uncertain. It has succeeded in comparatively few places, notwithstanding numerous efforts to establish it in various countries. In India, under cultivation, the root has been found to contain emetin equal in amount to that of the commercial article (Hooper, Pharm. Journ. [4] xxxvi. 1913, p. 554), but Johore and Selangor are so far the only countries where success on a commercial scale has been attained.

It can be propagated readily enough, any broken piece of the annulated roots making a new plant, and even the leaves will strike root. It also grows freely from cuttings and layers. The soil in Johore in which it succeeds has been described as "chocolate colour, rich in vegetable matter, wood ashes, etc." (Kew Bull. 1888, p. 128). Other conditions necessary are a moist atmosphere and a sheltered shady situation. Artificial shade is perhaps the best—the usual temporary structure of forked supports and palm leaves—for when planted under trees the drip from the leaves is liable to injure the plants. It is said to grow well under the shade of various species of palms—*Euterpe oleracea, Oenocarpus Bacaba,* etc. In its native country it rarely grows singly but several plants are clustered in the form of a loose round bush called "redoleros" (Pharm. Journ [3] iv. 1873, pp. 261, 262). In Brazil it occurs from 8° to 22° S. lat. in the forests of the Serra do Espinhaço, or mountains extending from Bahia through Minas Geraes to the Northern part of Sao Paulo, chiefly in the

"Matos Virgens" (or virgin tropical forests) and the "Catingas" (or woods composed of smaller deciduous trees) in moist, shady situations (Markham, Trans. Bot. Soc. Edin. x. 1870, p. 391.

Ipecacuanha is recorded as being cultivated at Lagos, 1892 (Rowland and Millen, List of Cultiv. Pl. Lagos), and at Abutshi—though not very successfully (Woodruff, Rep. Bot. Plantn. Abutshi, 20th May, 1890; Kew Bull. 1891, p. 94).

"The prospects of Ipecacuanha cultivation, which is no less important than that of Cinchona, is far less encouraging. This arises not so much from want of success in establishing and increasing the plant as from the apparently extremely slow growth of the underground rootstock from which the drug is obtained and the small yield of even a fully grown plant. Nevertheless the cultivation must be persevered with, the causes that retard the progress of this valuable herb under cultivation are those that raise the price of it in its native country" (Kew Report, 1874, p. 6). The importance of cultivating this plant is equally great at the present day. Southern Nigeria is one of the few places that could present the conditions essential to successful cultivation and parallel to those obtaining in Malaya where, especially at Johore, this plant is established on a commercial scale.

Ref.—Histoire Naturelle et Médicale des espèces d'Ipécacuanha du Commerce, Achille Richard, pp. 1–72, 2 plates (Béchet, Paris, 1820).——"*Cephäelis Ipecacuanha;* The True Ipecacuanha," in Mat. Med. Pereira, ii. pp. 1591-1601 (Longmans, London, 1853).——"Notes on the Propagation of the Ipecacuan Plant (*Cephäelis Ipecacuanha*)," M'Nab, in Trans. Bot. Soc. Edinburgh, x. 1870, pp. 318–324.——"Memorandum on Ipecacuanha," Markham, l.c. pp. 391–392.——"Remarks on the Ipecacuan Plant (*Cephäelis Ipecacuanha*), as cultivated in the Royal Bot. Gardens, Edinburgh, Balfour, in Trans. Roy. Soc. Edinburgh, xxvi. 1872, pp. 781–788.——"Pharmaceutical Results of the Calcutta Botanic Gardens; Acclimatization of Jalap and Ipecacuanha," in Pharm. Journ. [3] iv. 1873, pp. 221–222; Acclimatization of Ipecacuanha, pp. 241–242; pp. 261–263, from the Report of the Superintendent.——"Radix Ipecacuanha," in Pharmacographia, Flückiger and Hanbury, pp. 370–376.——"*Cephaelis Ipecacuanha,*" in Med. Pl. Bentley and Trimen, No. 145, 7 pages.——"*Cephäelis Ipecacuanha,*" in Med. Pflan. Köhler, i. 5 pages.——"Ipecacuanha (*Cephaelis Ipecacuanha*)," in Kew Bull. 1888, pp. 123–128.——Étude des Ipecuanhas de leurs Falsifications et des Substances Végétales qu'on peut leur Substitutuer, Jacquemet, pp. 1–326, illustrated (J. B. Ballière et Fils, Paris, 1889).——"Radix Ipecacuanha," in Lehrbuch der Pharmakognosie, Moeller, pp. 311 314 (Wien, 1889).——"*Cephäelis Ipecacuanha,*" in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 247–251.——Ipecacuanha, Handb. No. 2, 1892, Imp. Inst. Series, pp. 1–6.——"The Ipecacuanhas of English Commerce," Holmes, in Year Book of Pharmacy, 1893, pp. 402–408, including particulars of spurious Ipecacuanhas.——Ueber Ipecacuanha,

Moeller, in Pharm. Poste, No. 16, Wien, 1894.——"Ipécacuanhas," in Les Drogues Simples d'origine Végétal, Planchon, and Collin, ii. pp. 165–180 (Octave Doin, Paris, 1896).——"Note on Ipecacuanha Cultivation," Holmes, in Pharm. Journ. [4] xxviii. 1905, p. 765.——"Johore Ipecacuanha," in Museum Report, 1907–10, Pharm. Soc. Gt. Britain, Holmes, pp. 13–16. ——"Note on Ipecacuanha Cultivation," l.c. p. 57, with an analysis of Ipecacuanha Root.——"Johore Ipecacuanha," in Chem. and Druggist, Oct. 19th, 1912, pp. 615–616.——"Ipecacuanha Cultivation" in Chem. and Druggist, June 20th, 1914, pp. 937–938.

GRUMILEA, Gaertn.

Grumilea psychotrioides, *DC.*; Fl. Trop. Afr. III. p. 216.

Vernac. name.—Fure (Sierra Leone, *Scott Elliot*).

Aboh—Niger River, Onitsha.

Furnishes a red dye used by the natives of Sierra Leone for cloth (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 31).

Found as an under-shrub in the woods, Sierra Leone (l.c.).

MITRACARPUM, Zucc.

Mitracarpum scabrum, *Zucc.*; Fl. Trop. Afr. III. p. 243.

Vernac. names.—Gogomasu (Katagum, *Dalziel*); Irawo Ile or Irawoile (Lagos, *Dawodu*).

Lagos; Nupe; Kontagora; Bornu. Known also from the Gold Coast and the Gambia.

Much used in medicine, Lagos (Dawodu, Herb. Kew); leaves dried and placed over old ulcers, which are said to heal rapidly, Gambia, (Brown Lester, Kew Bull. 1891, p. 272); an antidote against arrow-poisons, Katagum (Dalziel, Herb. Kew).

An annual plant 1–2 ft. high. A common wayside weed, Kontagora (Dalziel, l.c.), in wet plains near the river, Nupe Barter, Herb. Kew); and common in hedges at Kuka, Bornu (Vogel, Herb. Kew).

COMPOSITAE.

SPARGANOPHORUS, Vaill.

Sparganophorus Vaillantii, *Gaertn.*; Fl. Trop. Afr. III. p. 262.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 165, f. 4; Jacq. Eclogae Pl. Rar. ii. t. 131 (*S. Struchium*); Pal de Beauv. Fl. Ow. Ben. i. t. 48 (*Struchium africanum*).

Vernac. names.—Ewuro Odo (Yoruba, *Millson*); Ewaruda (Sierra Leone, *Scott Elliot*).

Abeokuta in S. Nigeria, and also in Gold Coast, Cameroon, Togo, Congo, Fernando Po, and Niam-niam land, etc.

Used as a herb in soup, Yoruba (Millson, Kew Bull. 1891, p. 214), Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893,

p. 43), medicinally for headache by the natives, E. Akim, Gold Coast (Johnson, Herb. Kew).

An erect or decumbent herbaceous plant, found in swampy places, Fernando Po and near river Ofun, Abeokuta (Barter, Herb. Kew); 1–2 ft. Fernando Po (Mann, Herb. Kew); and near river, Efulen, stem succulent, rooting at joints (Bates, Herb. Kew); common in the marshes, Sierra Leone (Scott Elliot, l.c.).

VERNONIA, Schreb.

Vernonia amygdalina, *Delile*; Fl. Trop. Afr. III. p. 284.

Vernac. names.—Ewuro (Abeokuta, *Irving*); Grabra (Abyssinia, Fl. Trop. Afr. l.c.); Libo (St. Thomas, *Welwitsch*).—Bitter leaf of Sierra Leone (*Scott Elliot*).

Abeokuta; Oloke-Meji; Niger; Katagum; and widely distributed in West Trop. Africa, extending to the Congo and Abyssinia.

Used as a chewstick (Abeokuta, Irving, Herb. Kew), as a toothstick, Katagum (Dalziel, Herb. Kew), as a bitter Sierra Leone (Kirk, Fl. Trop. Afr. l.c.), and described as possessing a medicinal bitter root, St. Thomas (Hiern, Cat. Welw. Afr. Pl. iii. p. 530). The leaves are soaked in water and used for soup, also used in palaver sauce, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 42).

Found growing as a shrub 6–10 ft. high or small tree (Fl. Trop. Afr. l.c.), 6–8 ft., Katagum (Dalziel, Herb. Kew), a small tree or an arborescent shrub, in mountainous places at the outskirts of the forest at Monte Coffé, 1500–2000 ft. (Hiern, l.c.); cultivated at Freetown, Sierra Leone (Scott Elliot, Herb. Kew); often planted in hedges, Trop. Africa (Chevalier, Bull. Soc. Nat. d'Accl. de France, 1912, p. 110).

Vernonia cinerea, *Less.*; Fl. Trop. Afr. III. p. 275.

Ill.—Rheede, Hort. Mal. x. t. 64; Wight, Illust. t. 134, f. 1.

Vernac. names.—Orungo, Ewe jedijedi (Lagos, *Dawodu*); Elegbe Oju (Oloke-Meji, *Dodd*).—The Ash-coloured Flea-bane.

Lagos, Oloke-Meji, and widely distributed in Tropical Africa and in India.

Used medicinally in Lagos, where it is included in "Agbo" (see *Xylopia aethiopica*, p. 50); used medicinally in India, and the seeds are stated to be used in Patna as an alexipharmic and anthelmintic (Dict. Econ. Prod. India; Moloney, For. W. Afr. p. 371). Dymock, Warden and Hooper (Pharmacogr. Indica, ii. p. 243) state that the plant has no very sensible properties and the medicinal virtues ascribed to it by the Hindoos appear imaginary. The leaves are eaten as a pot-herb in Chutia Nagpur (Dict. Econ. Prod. India).

An erect herb 2–5 ft. high with reddish flowers; found in wet places in palm groves by the river Bengo near Panda (Hiern, Cat. Welw. Afr. Pl. iii. p. 521); in irrigation channels at Khailah, Hadramaut, 3000 ft. (Kew Bull. 1894, p. 333).

Vernonia Kotschyana, *Schultz*; Fl. Trop. Afr. III. p. 289.

Vernac. name.—Domashi (Katagum, *Dalziel*).

Katagum; found also in Nile land at Senaar, Kordofan, in Abyssinia and Bongoland.

A bitter medicine, Katagum (Dalziel, No. 173, 1907, Herb. Kew).

Vernonia nigritiana, *O. & H.*; Fl. Trop. Afr. III. p. 288.

Ill.—Heckel, Archiv. de Physiol. 1888, t. 1; Christy, New Comm. Pl. and Drugs, No. 11, 1889, p. 5.

Vernac. names.—Batjitjor or Batiator (Senegambia, *Heckel* and *Schlagdenhauffen*); Batjitor (Sierra Leone, *Scott Elliot*); Jubu Jamba (Gambia, *Brown Lester*).

Abeokuta; Oloke-Meji; Niger and W. Africa generally.

Used medicinally, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 50). Root described as a substitute for "Ipecacuanha" (*Psychotria Ipecacuanha*); pounded and boiled, taken as a purgative, Gambia (Brown Lester, Kew Bull. 1891, p.272); an infusion used as a diuretic, etc., in small doses, or as an emetic in large doses, French Guinea (Pobéguin, L'Agric. prat. pays chauds, xi. part 2, 1911, p. 236); sold in Senegambia, supposed to have febrifuge, emetic, anti-haemorrhagic and anti-dysenteric properties (Pharm. Journ. [3] xix. 1889, p. 578). "Vernonin," the glucoside, obtained from it is said to resemble digitalin in its action upon the heart (l.c.)

Found as an erect woody plant 1–2¼ ft. (Fl. Trop. Afr. l.c.).

Ref.—"Sur la racine du Batjitjor (*Vernonia nigritiana*) de l'Afrique tropicale, nouveau poison du coeur," Heckel and Schlagdenhauffen, in Archives de Physiologie, No. 6, Aug. 15th, 1888, pp. 1–36; Extract in New Comm. Pl. and Drugs, Christy, No. 11, 1889, pp. 5–8.

Vernonia Perrottetii, *Schl.*; Fl. Trop. Afr. III. p. 272.

Ill.—Trans. Linn. Soc. xxix (1875) t. 56, f. A.

Vernac. name.—Kwiajupong (Sierra Leone, *Scott Elliot*).

Niger to Northern Nigeria and other parts of Upper Guinea, and the Nile Land.

In Unyoro and Madi the natives mix the ashes of this plant and those of *Hygrophila spinosa*, T. And., with water and extract salt by evaporation (Grant, specimen from Madi, Herb. Kew; Trans. Linn. Soc. xxix. p. 90; Moloney, For W. Afr. p. 272; Fl. Trop. Afr. l.c.). Used as a vegetable, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 56).

An annual plant, 1–2 ft. high.

Vernonia senegalensis, *Less.*, Fl. Trop. Afr. III. p. 283.

Ill.—Sim, For. Fl. and For. Res. Port. E. Afr. t. 73 f. A; De Wildeman, Études Fl. Bangala, p. 116.

Vernac. names.—Tsumbi-lumi (M'Chopes, Zuvalla, *Sim*); Fantsa (Mozambique, *Stewart*); Malulo (W. Trop. Africa *Monteiro*); Molûlu (Pungo Andongo, *Welwitsch*).—Bitters Tree of the Gambia (Brown Lester, Kew Bull. 1891, p. 272); Quinine des Noirs of French Guinea (Pobéguin, L'Agric. prat. pays chauds, xi. 2, 1911, p. 236).

Niger, and widely distributed in West Africa—Senegambia, Sierra Leone, etc.; S.W. Africa; East Africa, etc.

Leaves used medicinally in French Guinea (Pobéguin, l.c.), chewed for their astringent properties, Gambia (Kew Bull. 1891, p. 272). The bark of the trunk and root is very bitter and furnishes an astringent decoction, used as a tonic, and in frequent use in cases of fever and diarrhoea, Angola (Hiern, Cat. Welw. Afr. Pl. iii. pp. 528, 529). According to Welwitsch (l.c. pp. 529, 530) the "Molûlus"—a collective term applied to three or four species of elegant bushes with white fragrant flowers belonging to Compositae—all furnish a tonic bitter bark and the flowers furnish abundant food for bees.

Found as a tree 10–15 ft. high, north and south banks of the Gambia (Kew Bull. l.c.); a shrub 6–8 ft. high, on stony hills at about 2000 ft. altitude (Cazengo), or a shrub-like little tree in hot stony thickets (Pungo Andongo), flowering and fruiting May and June, Angola, and further described by Welwitsch as remarkably ornamental and well worth cultivating (Hiern, l.c. pp. 529, 530).

ELEPHANTOPUS, Linn.

Elephantopus scaber, *Linn.*; Fl. Trop. Afr. III. p. 299.

Ill.—Dillenius, Hort. Eltham. t. 106 (*E. conyzaefolia*); Rheede, Hort. Mal. x. t. 7; Gaertner, Fruct. Sem. Pl. ii. t. 165; Lam. Encycl. t. 718; Wight. Ic. Pl. Ind. Or. iii. t. 1086.

Vernac. names.—Tambakombako (Madagascar, *Heckel*); Herbe de la jouissance (*Heckel*).—Prickly leaved elephant's foot.

Niger (Barter, No. 1972); Kontagora (Dalziel, No. 206, 1905); Okuni, Cross River (Holland, No. 169, 1900); widely distributed in W. Africa, and a common weed throughout the Tropics.

Plant possesses diuretic and febrifuge properties, Madagascar (Heckel, Ann. L'Inst. Col. Marseille, i. 1903, p. 151); various medicinal uses attributed to the decoctions of the root and leaves in India (Dict. Econ. Prod. India; Moloney, For. W. Afr. p. 372).

An erect plant 2–8 ft. high. In ravines and shady woods, Kontagora (Dalziel, l.c.); in dry and arid regions, Madagascar (Heckel, l.c.); 2 ft. high, erect, at an altitude of 5000 ft., Karague (Grant, Trans. Linn. Soc. xxix. p. 93); a perennial herb growing in a caespitose manner, with the habit of the genus, Angola (Hiern, Cat. Welw. Afr. Pl. iii. p. 540).

AGERATUM, Linn.

Ageratum conyzoides, *Linn.*; Fl. Trop. Afr. III. p. 300.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 165; Schk. Handb. t. 238; Lam. Encycl. t. 672; Hooker, Exotic, Flora, i. t. 15; Bot. Mag. t. 2524 (*A. mexicanum*); Wight. Illust. t. 134, f. 2.

Vernac. names.—Imi-esu (Lagos, *Dawodu*); Imi-esu (Oloke-Meji, *Dodd*); Akkaw-yunyun (Yoruba, *Millson*); Akan yunyun (Sierra Leone, *Scott Elliot*); Hanitrinimpantsaka, Fotsivony (Madagascar, *Heckel*); Raguet-francois (French Guiana, *Heckel*).

A native of Mexico, South America, and the West Indian Islands: common in Nigeria—everywhere from the sea to Borgu (Barter, No. 1030, Herb. Kew), Oloke-Meji (Dodd, No. 407, 1908, Herb. Kew), Old Calabar (Holland, No. 20, 1897, Herb. Kew)—widely spread in Tropical Africa, and all hot countries.

A decoction of the plant, used for "craw-craw" externally and for fever internally, Yoruba (Millson, Kew Bull. 1891, p. 215). Used medicinally in French Guiana (Heckel, Ann. L'Inst. Col. Marseille, iv. 1897, p. 140), in Madagascar (*Ibid.* l.c. i. 1903, pp. 89–90), and in Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 49; No. 9, 1906, Herb. Kew), found to contain a minute quantity of a crystalline alkaloid to which the physiological activity of the drug may be due (Col. Rep. Ann. No. 601, 1909, p. 43).

An annual plant increased by seeds or cuttings, easily grown in light rich soil, described so long ago as 1823 in reference to home gardens as "well deserving of a place in every stove; it flowers during a considerable period of the summer and even the severities of winter witness the expansion of its pretty blue blossoms" (Hooker, Exotic Flora, t. 15). There are several dwarf varieties—"Cupid," "Imperial Dwarf," "Queen," etc., used for bedding purposes in European gardens.

Mikania, Willd.

Mikania scandens, *Willd.*; Fl. Trop. Afr. III. p. 301.

Ill.—Jacq. Ic. Pl. Rar. i. t. 169 (*Eupatorium scandens*); Desc. Ant. vii. t. 484 (*Eupatorium scandens*); Goodale, Wild Fl. America, t. 34.

Vernac. names.—Iyawa (Yoruba, *Millson*); Nore (French Guinea, *Farmar*); Wedwedwi (Zambesi, *Peters, Meller*); Wa Batako (Fiji, *Knowles*); Guaco (Mexico, *Ramirez*).—Climbing Hemp-weed (*Goodale*).

Abeokuta, Nun River (Niger), Old Calabar, in S. Nigeria: Nupe, Sokoto, in N. Nigeria, and throughout Tropical Africa. Introduced from Malaya.

A fodder plant, relished in the green state by cattle at all times, especially in the dry season when food is scarce, Ceylon (MacMillan, Roy. Bot. Gardens, Ceylon, Circ. No. 1, Sept. 1911, p. 16). Recommended as a cover plant to keep down weeds in plantations, Fed. Malay States, Ceylon, and Borneo (*see* under *Passiflora foetida*, p. 326). The whitish-yellow flower heads are said to furnish ample food for bees, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iii. p. 543).

Found as a climber on river banks, Nupe (Barter, No. 186, Herb. Kew), a climbing herbaceous plant, 60 ft., Nun River

(Mann, No. 496, 1860, Herb. Kew), 10–15 ft. high, Cameroon Mts. at 4000–7000 ft. (Mann, No. 1924, 1860, l.c.), a shrub, woody at the base, climbing to a great height, frequently covering whole tracts of the forest—the flowers of a faint brimstone colour making the dells of the forest with the broad tops of such trees as *Albizzia*, etc., appear as if coated with powdered sulphur, Golungo Alto (Hiern, l.c.), climbs up stumps and often forms a thick carpet on the land, Fiji (Knowles, Kew Bull. 1907, p. 306).

Ref.—See under *Passiflora foetida*, p. 326.

Grangea, Adans.

Grangea maderaspatana, *Poir.*; Fl. Trop. Afr. III. p. 304.

Ill.—Rheede, Hort. Mal. x. t. 49; Lam. Encycl. t. 699; Wight, Ic. Pl. Ind. Or. iii. t. 1097.

Vernac. names.—Phunat (Arabic, Sudan, *Broun*); Montomaso, Angea (Madagascar, *Heckel*); Marcella (Brazil, *Moloney*); Macella (sometimes so-called, Loanda, *Welwitsch*).

Nupe, Katagum, and widely distributed in Tropical Africa; Tropical and Sub-tropical Asia, Madagascar.

The leaves have various medicinal uses in Madasgascar (Heckel, Ann. L'Inst. Col. Marseille, i. 1903, p. 130), in India—stomachic, deobstruent and antispasmodic (Molony, For. W. Afr. p. 372), juice for earache, etc. (Dict. Econ. Prod. India), and in Brazil the plant is used as a substitute for chamomile (Moloney, l.c.).

Found as a prostrate herb. Katagum (Dalziel, No. 174, 1908, Herb. Kew), in wet places, Nupe (Barter, No. 1200, Herb. Kew), very abundant about pools left after the rains, Loanda (Hiern, Cat. Welw. Afr. Pl. iii. p. 545).

Blumea, DC.

Blumea lacera, *DC.*; Fl. Trop. Afr. III. p. 322.

Ill.—Deless. Ic. iv. t. 23 (*B. Musra*).

Vernac. names.—Numúrdi (Konkan, Bombay, *Watt*); Kakronda? (Bombay, *Dymock*); Quitoco antiscorbutico (Golungo Alto, *Welwitsch*); Burro Kooksima (India, Mus. Kew).

Nupe and elsewhere in Tropical Africa; Asia and Australia.

Used to drive away fleas and other insects, Konkan (Dict. Econ. Prod. India) as a febrifuge and also to stop bleeding, given mixed with black pepper in cholera, an astringent eye wash is made from the leaves and the expressed juice of the leaves is a useful anthelmintic, has a powerful camphoraceous odour, and suggested as a possible source of an insect powder (Dymock, Pharm. Journ. [3] xiv. 1884, p. 985); antiscorbutic (Hiern, Cat. Welw. Afr. Pl. iii. p. 555). 150 lb. of the fresh herb in flower, submitted to distillation in the usual way with water yielded about 2 ounces of a light-yellow essential oil (Dict. Econ. Prod. India).

Herbaceous plant 2–4 ft. high in marshy meadows and damp places, root conical, apparently annual, stem with crowded leaves at the base, Angola (Hiern, l.c.).

Blumea aurita, DC. has been mentioned as having similar properties to *B. lacera*, but according to Watt (Dict. Econ. Prod. India) it does not appear to have any known economic property.

Ref.—"The Essential Oils of *Blumea lacera* and *Sphaeranthus indicus*," Dymock, in Pharm. Journ. [3] xiv. 1884, p. 985.—— "*Blumea lacera*," in Dict. Econ. Prod. India, i. 1889, p. 459.

Sphaeranthus, Linn.

Sphaeranthus hirtus, *Willd.*; Fl. Trop. Afr. III. p. 334. [*S. indicus*, Linn].

Ill.—Rheede, Hort. Mal. x. t. 43; Gaertner, Fruct. Sem. Pl. ii. t. 164 (*S. indicus*); Lam. Encycl. t. 718, f. 1 (*S. hirtus*), f. 2 (*S. indicus*); Wight. Ic. Pl. Ind. Or. iii. t. 1094 (*S. hirtus*).

Vernac. names.—Lookidge (Gambia, *Ozanne*); Koksim (Calcutta, Mus. Kew); Mundi, Gorakmúndi, Munditika, Murmuria, Kottak-Karandai (India, *Dymock*).

Kontagora, Zungeru and West Africa in general extending to Mozambique, also in India, Malay Islands and Australia.

Various medicinal uses attributed to the flowers, bark, root and seeds (Watt, Dict. Econ. Prod. India; Dymock, Pharm. Journ. [3] xiv. 1884, p. 985; Moloney, For. W. Afr. p. 373, etc.). On the Gambia the plant is gathered and spread thickly on beds on which sick persons are laid, to relieve pain and to induce sleep (Ozanne, Kew Bull. 1893, p. 371). A reputed general tonic, deobstruent, alterative and aphrodisiac (Dymock, l.c.).

An erect or ascending, branching plant 2–3 ft. high; or an annual prostrate herb with ascending branchlets, fragrant (Hiern, Cat. Welw. Afr. Pl. iii. p. 558) with a rose-like perfume (Dymock). Found in Kontagora in fields and damp spots in bush (Dalziel, No. 189, Herb. Kew).

Pulicaria, Gaert.

Pulicaria crispa, *Benth. & Hook.*; Fl. Trop. Afr. III. p. 366.

Vernac. name.—Bilbila (Katagum, *Dalziel*).

Niger, Katagum, Kontagora, Borgu. Occurring also in Senegambia, Nile Land, Arabia, Egypt, India, etc.

The dried plant bruised and applied as a vulnerary to bruises, etc., of bullocks, India (Dict. Econ. Prod. India).

Herbaceous plant 1–2½ ft. high, found in fields and on waysides, Kontagora (Dalziel, No. 201, 1905, Herb. Kew).

Eclipta, Linn.

Eclipta alba, *Hassk.*; Fl. Trop. Afr. III. p. 373.

Ill.—Bettfreund, Fl. Argent. ii. t. 68 (var. *longifolia*); iii. t. 113 (var. *elliptica*).

Vernac. names.—Abikolo (Lagos, *MacGregor*); Arojoku (Yoruba, *Millson*).

Lagos, Nun River (Niger), Nupe, and widely distributed in Tropical Africa and other warm countries.

Used as a remedy for diarrhœa, and as a black stain for the hair, Brazil (Mus. Kew; Moloney, For. W. Afr. p. 374). The root is said to be an excellent substitute for *Taraxacum*. Various medicinal uses are attributed to the plant in India, and in tattooing the natives rub the juicy green leaves over the skin after puncturing, to produce the desired indelible deep bluish-black (Dict. Econ. Prod. India).

Herbaceous plant 3–4 ft. high, on sandbanks Nun River (Mann, No. 470, 1860, Herb. Kew), Shai Plains, Gold Coast (Johnson, No. 570, 1900, Herb. Kew), in wet places, Nupe (Barter, No. 865, Herb. Kew), in low and marshy places, Angola (Monteiro, Herb. Kew), in drying up marshes, where it occasionally becomes biennial or even persists for three years, Loanda (Hiern, Cat. Welw. Afr. Pl. iii. p. 575), a common weed.

Ref.—"*Eclipta alba*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 201–202.

Aspilia, Thouars.

Aspilia latifolia, *O. & H.*; Fl. Trop. Afr. III. p. 379.

Vernac. name.—Yun-yun (Yoruba, *Millson*).—Haemorrhage plant.

Lagos, Old Calabar, Yoruba, Lokoja, Niger River, and also collected (by Vogel) at Accra, and (by Schweinfurth) in Djurland and Niam-Niam Land.

The pounded leaves and flowers applied to a wound are said to stop the bleeding in a few minutes and to heal the wound rapidly; used in Liberia for this purpose (Moloney, For. W. Afr. p. 374; Holmes, Pharm. Journ. [3] viii. 1878, p. 563; Christy, New Comm. Pl. and Drugs, No. 2, 1878, and No. 3, 1880).

A more or less hispid herb, $1\frac{1}{2}$–4 ft. high, Old Calabar River (Mann, No. 2325, 1863, Herb. Kew).

Helianthus, Linn.

Helianthus annuus, *Linn.*; Sp. Pl. (1753) p. 904.

An annual plant, usually single rod-like stems 6 ft. or so high. Flower heads, disc-like, 10–20 in. across, yellow; stalk a foot or so from the top up to $\frac{3}{4}$in. in diam., pithy (half an inch or so) in the centre. Seeds $\frac{3}{8}$ in. long $\frac{1}{4}$ in. broad up to $\frac{1}{2}$ in. by $\frac{3}{8}$ in., rhomboidal, narrowing to a broad point, set in small leafy cups; black, white, black and white striped or brown and white striped.

Ill.—Reneaulme, Spec. Hist. Pl. Paris, t. 83; Lam. Encycl. t. 706; Velloso, Fl. Alogr. Brazil, p. 207; Bilberg, Ekonom. Bot. t. 9; Abh. Senck. i. t. 6; Rchb. Fl. Germ. xvi. t. 940, f. 1; Mackay, Man. Grasses, N. Zealand, i. t. 28; Wiley, U.S. Dept. Agric. Div.

Chemistry, Bull. No. 60, 1901, t. 1; Bull. Agric. du Congo Belge, iii. 1912, p. 717, f. 496 (Cultivé à Kinsengwa).

Sunflower.

Native probably of N. America, common in Mexico, extending to Peru, etc., and under cultivation in many tropical and sub-tropical countries.

The seeds are used for feeding poultry, and in Russia they are eaten like nuts by the people; roasted and ground they are sometimes used as a substitute for coffee. They yield an oil suitable for culinary and table purposes, also for lubricating, wool-dressing, candle-making, soap-making, and in the manufacture of margarine; said to be equal to olive or almond oil, etc., for which it is sometimes substituted. The residue after the extraction of the oil is pressed into cakes and used for feeding cattle—for which purpose it is considered advisable to grind it into as fine a meal as possible to admit of easier digestion, this cake being harder than most oil cakes, and almost impossible for cattle to chew in large pieces. The leaves mixed with bran are also considered good fodder for cattle and horses. The stalks yield a fibre, and they may be used for paper making, though Dodge (Cat. Fiber Pl. of the World, p. 189) states that there are many American plants better adapted to this purpose.

The stems are also burnt to produce carbonate of potash in the Trans-Caucasus (Board of Trade Journ. Dec. 5, 1907, p. 454; 6736 tons exported in 1912, Cons. Rep. Ann. No. 5078, 1913, p. 27), of which it is stated an acre of plants will produce half a ton (British Export Journ. Oct. 15, 1897).

The flowers are suitable for feeding bees.

The cultivation is comparatively easy. There are several well marked varieties grown for seed—"African Black Giant," "Black Seed," "Black Giant," "Chinese Giant," "Giant Russian," "Mammoth," "Prize Mammoth," "Russian," "Large Russian," "Mammoth Russian," "Tall Russian," "White Russian," and "White Beauty" (enumerated as American varieties by Tracy, U.S. Dept. Agric. Bureau Pl. Industry, Bull. No. 21, 1903, p. 352). The main requirements are a warm climate, moderate rainfall, light, rich and well drained soil. From 5–10 lb. of seed will sow an acre, broadcast or in rows about 3 ft. apart, thinning out as required so that the plants stand, for full development, about 18 in. apart each way. The plants come to maturity in about four months, and should be harvested before being quite ripe. The seeds may be removed from the heads—the same day as gathered, if possible—with an ordinary flail or by specially constructed cylindrical machines.

The yield of seed has been given at 900–1500 lb. per acre, giving 15–20 per cent. of oil (Cape Agric. Journ. xxv. 1908, p. 85; Bull. Imp. Inst. vi. 1908, p. 84; Journ Bd. Agric. xv. 1908, p. 370), 18 cwt. of good clean seed per acre, giving 300 lb. of oil or 18 per cent. of the weight harvested, and on average land

50 bushels to the acre, yielding 1 gallon of oil per bushel, has been obtained (Journ. Soc. Arts, li. 1903, p. 419; Proc. and Journ. Agric. Hort. Soc. India, April–June, 1903, p. 49; British Export Journ., Oct. 15th, 1897).

In storing the seed care is required to avoid over-heating, comparatively small quantities should be heaped, and the heaps should be turned regularly to keep the seed fresh and sweet.

Trans-Caucasus is an important centre for the production of seed oil and cake. 20,099 tons of seed were exported from Novorossisk in 1911 (Cons. Rep. Ann. No. 5078, 1913, p. 27). The output of oilcake from Novorossisk, Trans-Caucasus, was estimated in 1907 at 800,000 tons (Board of Trade Journ. Dec. 5th, 1907, p. 454), and in 1911 at 131,615 tons (Cons. Rep. l.c. p. 29). The United Kingdom was the principal importer of seed from the N. Caucasus in 1911 (Cons. Rep. l.c. p. 27), and Denmark is the principal market for the cake.

Ref.—"Sunflower (*Helianthus annuus*)," in Cultural Industries for Queensland, Bernays, pp. 171–173 (Government Printer, Brisbane, 1883).——"Sunflower (*Helianthus annuus*,)" in A Manual of Grasses and Forage Plants Useful to New Zealand, Part 1, Mackay, pp. 63–65 (Govt. Printer, Wellington, 1887).——"*Helianthus annuus*," in Dict. Econ. Prod. India, Watt. iv. 1890, pp. 209–211.——"Soleil ou Tournesol," in Des Pl. Industrielles, Heuzé, ii. pp. 151–155 (Libraire Agric. de la Maison Rustique, Paris, 1893).——The Sunflower Plant: Its Cultivation, Composition and Uses, Wiley, U.S. Dept. Agric. Div. Chemistry, Bull. No. 60, 1901, pp. 1–31.——"The Sunflower" . . . in Proc. and Journ. Agric. Hort. Soc. India, April–June, 1903, pp. 48–62.——"The Sunflower as a Crop," Agric. News, Barbados, 1904, p. 54.——"The Sunflower as a Preventive of Malaria," in Journ. Soc. Arts, li. 1903, pp. 418–419.——"*Helianthus annuus*: Sunflower," Hooper, in Agric. Ledger, No. 1, 1907, pp. 1–11.——"Sunflower," Ten Eyck, in Cycl. American Agric. Bailey, ii. pp. 611–613 (Macmillian and Co., Ltd., London and New York, 1907).——"Cultivation of Sunflower Seed in Russia," in Dip. and Cons. Rep. Ann. No. 4965, 1912, pp. 22–23; Reprint in Journ. Bd. Agric. xix. Oct. 1912, pp. 591–592; Abstract in Bull. Imp. Inst. xi. 1913, pp. 156–157.——"Sunflower Oil," in Fatty Foods: Their Practical Examination, Bolton and Revis, pp. 238–240, with analyses of the cake and oil (J. and A. Churchill, London, 1913).——"Sunflower Seed," in Col. Rep. Misc. No. 88, 1914, pp. 467–468, with analysis of seed oil.——"Sunflower-Seed Oil" (The Oil Resources of the Empire), Perkin, in Journ. Roy. Soc. Arts, lxii. p. 483.

Helianthus tuberosus, *Linn.*; Sp. Pl. (1753), p. 905.

A herbaceous perennial. Roots, tuberous, more or less purple, resembling the potato in general appearance, but unlike this contains no starch. Stems strong, 6–10 ft. high. Leaves alternate, scabrous, varying in shape from cordate-ovate in those of the

lower to ovate-acuminate in the upper part of the stem. Flowers yellow, terminal.

Ill.—Jacq. Hort. Bot. Vindob. ii. t. 161; Plenck. Ic. t. 638; Schk. Handb. t. 258; Mem. Mus. Paris. xix. (1830), t. 4; Rchb. Ic. Fl. Germ. xvi. t. 940, f. 2; Bot. Mag. t. 7545; Gard. Chron. Dec. 4th, 1909, p. 374, f. 163 (tubers).

Vernac. names.—Gwaza (Zaria, *Dudgeon*); Artichoke, Jerusalem Artichoke.

Native of N. America. Introduced to Europe, Asia, Africa, etc.

Cultivated generally as a vegetable, and to some extent for the production of Alcohol (Kew Bull. 1912, p. 119).

The cultivation is approximately the same as for the Potato. The requirements are a warm climate, moderate rainfall and fairly rich soil. The tubers are planted 3 in. deep in rows about $1\frac{1}{2}$ ft. apart, and earthed up in drills when a few feet high. The crop is ready for harvesting when the stems begin to dry and wither, after about four months growth. The tubers may be left in the ground and dug up as required or they may be stored in any convenient receptacle covered with earth or sand, especially in countries where growth is more or less continuous all the year round.

The yield of tubers per acre may be 3 tons and upwards. In Hungary more than 8 tons per acre have been obtained with over 3 tons of stems and leaves (7410 lb. of stems and leaves and 18,320 lb. tubers, Journ. Bd. Agric. xx. 1913, p. 143).

The yield on an experimental scale in Nairobi, B.E. Africa, has been estimated at about 4 tons per acre [7 tubers, planted 3 ft. apart, giving 14 lb. on maturity after approx. 4 months' growth—13th Jan. to 8th May] (Col. Rep. Ann. No. 519, 1907, p. 74). At the distance apart of $1\frac{1}{2}$ ft. as previously recommended this would represent a very fair yield per acre.

Jerusalem Artichokes are cultivated to the south of Zaria town (Dudgeon, Agric. and For. Prod. W. Afr. p. 154).

"Helianthi" is a closely allied plant that has been advised as equal if not superior to the Jerusalem Artichoke (*see Helianthus decapetalus*, in Gard. Chron. Dec. 8, 1906, p. 393; Revue Horticole, 1907, pp. 136–140; *H. macrophyllus*, var. *sativa*, in Notizblatt, Bot. Gart. Berlin, 1909, pp. 107–108; *H. laetiflorus*, in Gard. Chron. Dec. 4, 1909, p. 374) but some recent experiments in Hungary (Journ. Bd. Agric. l.c. from Deut. Landw. Presse, Oct. 26th, 1912) seem to show conclusively that it is less valuable as a forage crop—see the figures mentioned above against 2820 lb. of stems and leaves, and 4940 lb. tubers per acre for "Helianthi." Further disadvantages lie in the percentage of plant failures (50 per cent. "Helianthi," 7 per cent. "Jerusalem Artichoke") and the difficulty of harvesting the tubers—spades having to be used for "Helianthi" on account of the long underground runners, while those of the Jerusalem Artichoke, being close together as in the potato can be harvested with a hoe.

Ref.—"*Helianthus tuberosus*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 211–212.——"The Jerusalem Artichoke," W.W. in Gardeners' Chronicle, Dec. 4th, 1909, p. 374.

Spilanthes, Linn.

Spilanthes Acmella, *Linn.*; Fl. Trop. Afr. III. p. 384.

Ill.—Rumpf, Amb. vi. t. 65; Plenck. Ic. t. 604; Raffeneau-Delile, Cent. Pl. Afr. Voy. Méroé, t. 3, f. 7 (*Acmella caulorrhiza*); Annalen d'Pharmacie, 1836, t. 2.

Vernac. names.—Awere pepe (Oloke-Meji, *Foster*); Tonjatula (Uganda, *Rutter*); Akmalla (India, *Watt*); Anamafana, Anamalaho, Kimontodoha (Madagascar, *Heckel*).—The Para Cress of Brazil, Cresson-Para Cresson des Indes (*Heckel*).

Lagos; Oloke-Meji; Old Calabar, and widely distributed in Tropical Africa, and the warmer parts of the Old World.

The plant is described as antiscorbutic, diuretic, syllagogue, odontalgic, tonic, and digestive (Heckel, Pl. Med. Madagascar, in Ann. L'Inst. Col. Marseille, i. 1903, p. 76). Chewed by the natives as a specific for toothache, Old Calabar (Sampson, Herb. Kew); used by Europeans and Natives in India for similar purposes (Dict. Econ. Prod. India). Eaten in salads (French Guiana (Heckel, Pl. Med. Guy. Franç. l.c. iv. 1897, p. 109). The flower heads have a hot burning taste and cause profuse salivation (Moloney, For. W. Afr. p. 376). The whole plant is pungent to the taste, and the flower heads especially so, though these distilled with water afford a distillate free from pungency; the active principle is also rendered inert by boiling (Dymock, Warden and Hooper, Pharmacogr. Indica, ii. p. 284).

An annual plant, creeping at the base or ascending; a few inches to a foot high, rooting at the nodes and therefore easily propagated. Found by the roadside, Sierra Leone (Scott Elliot, Herb. Kew; Barter, Herb. Kew), a weed, Lagos (Millen, Herb. Kew), 10 inches high from creeping roots, at an altitude of 4700 ft., East Coast Africa (Speke and Grant, Herb. Kew), 6500–7000 ft. Masuku Plateau, Nyasaland (Whyte, Herb. Kew), in the Himalaya up to 5000 ft. cultivated and wild throughout India (Dict. Econ. Prod. India), and wild and in cultivated fields, Madagascar (Heckel, l.c. i. 1903, p. 76).

Bidens, Linn.

Bidens pilosa, *Linn.*; Fl. Trop. Afr. III. p. 392.

Ill.—Rumpf, Amb. vi. t. 15; Gaertner, Fruct. Sem. Pl. ii. t. 167; Lam. Encycl. t. 668; Transv. Agric. Journ. ii. tt. 27, 28.

Vernac. names.—Abere Oloko (Lagos, *Dawodu*); Akesin-maso (Lagos, *Dennett*).—Black Jack (Chirinde, *Swynnerton*).

Lagos: Old Calabar, and widely distributed in the Tropics.

Used medicinally, Lagos (Dennett, Herb. Kew), also as a vegetable, Lagos (Dawodu, Herb. Kew).

An erect annual $\frac{1}{4}$–5 ft. high, usually regarded as a common weed. Found in cultivated ground (Chirinde, Swynnerton); common in and near cornfields, the seed vessels attaching themselves to everything they come in contact with, flowering in December, Karagwe (Grant, Trans. Linn. Soc. xxix. p. 99).

Artemisia, Linn.

Artemisia Judaica, *Linn.*; Fl. Palaest. in Amoen. Acad. iv. p. 463, et Mantissa Altera (1771), p. 281.

Somewhat shrubby, about $1\frac{1}{2}$ ft. high. Leaves minute, obovate, obtuse, flat, subtomentose, ash-coloured. Inflorescence a paniculate raceme. Flower heads rounded.

Ill.—Plukenet, Phytog. t. 73, f. 2; Plenck. Ic. t. 610; Delile, Egypt, t. 43; Nees von Esenbeck, Plant Medic. Düsseld. t. 229; Wagner, Pharm. Medic. Bot. t. 233.

Vernac. name.—Buaiterân (Arabic, *Post*).

Native of Syria, Egypt, Arabia, etc.

An aromatic bitter, used in medicine in Arabia and Egypt.

There is in the Kew Museum a sample of this herb obtained near Lake Chad by the Royal Niger Co. in 1890, probably conveyed there by the Arabs in the ordinary course of trade across the desert from N. Africa.

The plant has not been recorded from Nigeria.

Gynura, Cass.

Gynura cernua, *Benth.*; Fl. Trop. Afr. III. p. 402.

Ill.—Jacq. Hort. Bot. Vindob. iii. t. 98 (*Senecio rubens*).

Vernac. names.—Efo Ebure (Oloke-Meji, *Dodd*); Efo Ebure (Lagos, *McLeod, Hislop*); Ebolo (Lagos, *Dawodu*); Anamdrambo, Maimbola, Fitangosana (Madagascar, *Heckel*).

Lagos, Oloke-Meji, Niger, and various parts of Tropical Africa, extending to Abyssinia, Madagascar, etc.

Used for various medicinal purposes, Madagascar (Heckel, Pl. Med. Madagascar, in Ann. L'Inst. Col. Marseille, i. 1903, p. 77), as a vegetable, Lagos (Hislop, Herb. Kew).

An erect branched annual, about 2–3 ft. high. Found at an altitude of 6000–7000 ft. Abyssinia (Schimper); common in cultivated fields, Madagascar (Heckel, l.c.).

Emilia, Cass.

Emilia sagittata, *DC.*; Fl. Trop. Afr. III. p. 322.

Ill.—Cass. Dict. xiv. t. 5 (*Emilea flammea*).

Vernac. names.—Odundun Odo (Lagos, *MacGregor*); Aro agbe (Lagos, *Dawodu*).

Lagos (Phillips, No. 44; MacGregor, No. 114, Herb. Kew); Aboh (Barter, No. 180, Herb. Kew); Abeokuta (Irving, No. 79, Herb. Kew); Onitsha (Barter, No. 1751, Herb. Kew); Lokoja

(Parsons, Herb. Kew). Has been found also in Angola, Zanzibar, etc., and occurs in India.

Used medicinally for children, Lagos (Dawodu, Herb. Kew).

An erect glabrous annual $\frac{1}{4}$–4 ft. high.

E. sonchifolia is a common tropical weed, used in India as a febrifuge and for various medicinal purposes, and in China the leaves are eaten in salads (Moloney, For. W. Afr. p. 375).

Senecio, Linn.

Senecio abyssinicus, *Sch.*; Fl. Trop. Afr. III. p. 410.

Vernac. name.—Amunimuye (Oloke-Meji, *Dodd*).

Lagos; Oloke Meji. Also in Mombuttu Land and Abyssinia.

Leaves used medicinally, Oloke-Meji (Dodd, No. 433, 1908, Herb. Kew).

An erect annual about $\frac{1}{4}$–1 ft. high. Found near banks of Ogun River, Lagos, as a weed in yam ground (Millen, No. 121, Herb. Kew), at an altitude of 3900 ft. Entebbe (Brown, No. 15, 1904, Herb. Kew).

Senecio baberka, *Hutchinson* in Kew Bulletin, 1913, p. 180.

A herb up to $1\frac{1}{2}$ in. high; stems simple or sparingly branched, erect, glabrous. Leaves sessile, lanceolate or oblanceolate, apex obtuse, narrowed to the base, $\frac{3}{4}$–$1\frac{3}{4}$ in. long, $1\frac{1}{2}$–4 lin. broad, entire, thinly chartaceous, glabrous, pale green, 3–5 nerved from the base, nerves sub-parallel with the margin, prominent on both sides. Heads yellow, solitary, long, pedunculate, radiate, oblong in outline, about $\frac{3}{4}$ in. long and in diameter; peduncles $1\frac{3}{4}$–6 in. long, not bracteate, glabrous. Involucral bracts in one series, free, linear or linear-oblong, obtusely acuminate, $\frac{2}{5}$ in. long, coriaceous, with membranous margins, glabrous except the puberulous tips of the margins. Receptacle slightly concave, smooth. Ray-flowers, fertile, few. Disk-flowers numerous. Pappus white, barbellate. Achenes linear-oblong, $2\frac{1}{2}$ lin. long, ribbed, the ribs shortly whitish pubescent.

Vernac. name.—Baberka (Katagum, *Dalziel*).

Nigeria, Katagum District (Dalziel, No. 390, 1907, Herb. Kew).

A bitter medicine.

Centaurea, Linn.

Centaurea Perrottetii, *DC.* [*C. Calcitrapa,* Oliv. & Hiern, Fl. Trop. Afr. iii. p. 437, *non* Linn.].

Vernac. name.—Deyi (Katagum, *Dalziel*).

Katagum (Dalziel, No. 176, 1907, Herb. Kew); Kouka, Bornu (E. Vogel, No. 17 and 51, 1856, Herb. Kew); Bornu (Elliott, No. 129, Herb. Kew), and in Senegambia, Nile Land, etc.

A common camel food, Katagum (Dalziel, l.c.; Grant, Trans. Linn. Soc. xxix. p. 101).

An erect annual or biennial 1–2 ft. high. A weed growing in sand, Bornu (Elliott, l.c.). Plentiful on the desert ground near Thebes and Carnac, Nile region (Grant, l.c.).

Carthamus, Linn.

Carthamus lanatus, *Linn.*; Fl. Trop. Afr. III. p. 439.

Ill.—Gaertner, Fruct. Sem. Pl. ii. t. 161 (*Atractylis Fusus-agrestis*); Schk. Handb. t. 233; Bot. Mag. t. 2142; Sibth. Fl. Graec. ix. t. 841; Rchb. Ic. Fl. Germ. xv. t. 746, f. II.

Blessed Thistle; Woolly Carthamus; Yellow Distaff Thistle.

Mediterranean Region, Canary Islands, Madeira, Nile Land. Introduced to Abyssinia, and widely cultivated.

Said to possess sudorific, febrifuge and anthelmintic properties.

Carthamus tinctorius, *Linn.*; Fl. Trop. Afr. III. p. 439.

Ill.—Rumpf. Amb. v. t. 79; Gaertner, Fruct. Sem. Pl. ii. t. 161; Schk. Handb. t. 233; Lam. Encycl. t. 661, f. 3; Plenck, Ic. t. 600; Bot. Reg. ii (1816), t. 170; Nees von Esenbeck, Plant. Medic. Düsseld. t. 227; Rchb. Ic. Fl. Germ. xv. t. 746, f. 1; Berg, Charact. t. 48, No. 372; Duthie, Field Crops, t. 13; Heuzé, Pl. Industrielles, ii. p. 345; Cat. Mat. Med. Mexico, v. 1, p. 34; Bailey, Cycl. Amer. Agric. ii. p. 270, f. 375; Howard and Rahman Khan, Mem. Dept. Agric. India, Series 3, Oct. 1910, tt. 12, 13.

Vernac. names.—Gartoom (Egypt, *Grant*); Kurtum (Sudan, *Beam*); Essfar (Sudan, Bull. Imp. Inst. ix. 1911, p. 202); Kassoumbo (Oceania, *Heuzé*); Kurdee (India).—Safflower, Bastard Saffron, Carthamine Dye.

Cultivated in the Sudan, Nubia, Senaar, Abyssinia, India, China, S. Europe, etc. Mentioned in List of Plants cultivated at Lagos (Rowland and Millen). The Botanical Register (ii. 1816, t. 170) gives Egypt as the native country.

A rose-coloured dye is obtained from the flowers. In France and Spain the florets are picked off and dried in the shade; in Egypt and India they are washed in cold water, slightly pressed into lumps and dried in the shade, the latter it is said have about double the value of those prepared by the former method (Journ. Soc. Arts, xix. 1871, p. 817; Pharm. Journ. [3] ii. 1871, p. 455). It is necessary when washing and preparing the trade product to see that nothing alkaline touches it until the dye is actually required—the carthamine being obtained by treatment with an alkaline solution. A sample of Safflower, described as "poor," was received at Kew from the Royal Niger Co. in June, 1890.

As a dye for silks and cottons, Safflower, once of considerable importance, is, in common with Madder (*Rubia tinctorum*) and others, now almost forgotten owing to the development of the artificial dyes, though in Indian bazaars (Watt, Comm. Prod. India, p. 278) it has lost nothing in importance for local use in spite of foreign dyes, due mainly to the colour being more or less

sacred for wedding garments. Safflower was formerly largely imported for the manufacture of rouge, for which purpose it may still possess some importance.

The seeds are edible especially after roasting and are also good food for poultry. In Télegu fried safflower seed is ground together with tamarind, salt and fried chillies to make "chutney." Roasted seed mixed with fried rice wafers, Bengal gram, etc., is sold in the bazaars (Trop. Agric. xxx. 1908, p. 41).

The kernels yield about 30 per cent. of oil (*see* Tech. Rep. and Sci. Papers, Imp. Inst. 1903, for analyses of various oils from the dye plant and the thorny and thornless varieties, p. 128) suitable for culinary purposes, soap-making, and burning in lamps—when expressed by the dry cold process, and for lubrication, salve for cattle sores, and as a preservative for leathern vessels, ropes, etc., or any material subject to the action of water when extracted by the dry hot process, in which the seeds are usually expressed unhusked. It should also prove of value for soap-making. "Roghan" is a thick jelly-like substance, prepared from the oil obtained from the seeds by cold pressure, boiled for twelve hours, then thrown while hot into shallow pans of cold water. It is used in the manufacture of "Afridi Wax Cloth," and has been suggested for use as a waterproofing material or in the manufacture of linoleum (Journ. Soc. Arts, l. 1902, p. 210).

The cake after the expression of the husked seeds is a good cattle food, though inferior to sunflower cake. The young plants (of the spineless forms, *seq.*) may be used as fodder, as a vegetable or pot-herb. The stems burn freely and are used as fuel, and (in India) for making matches.

The plant is an annual about 3 ft. in height, and under cultivation there are two marked forms—spiny and spineless with usually yellow and orange flowers respectively, the occurrence of intermediate forms being more or less common. In general the more spiny plants are grown for seed alone, and the less spiny are grown for the flower, the seed, and as fodder.

A light sandy or loamy soil well cultivated, a fair amount of moisture—natural rainfall, or the crop is a suitable one for irrigation—and a warm climate are desirable.

The central flower bud should be nipped off as soon as it appears, to induce a bushy growth; but beyond ordinary weeding, keeping the surface stirred and irrigating if necessary, not much skill is required.

The seed may be sown broadcast or in drills, about 18 inches apart, and put in about 2 in. below the surface. From 10–15 lb. of seed will be required to sow an acre. A good yield will be about 100–120 lb. of dry flowers, and 1000–1500 lb. seed per acre. About 20–30 per cent. of oil may be obtained from the seeds.

Special care is necessary in gathering the flowers regularly, the plants should be gone over every two or three days during the flowering period. The crop is ripe for seed when the plants

begin to turn yellow; they may then be uprooted, left on the ground to dry for a day or two, when the seed may be beaten out with a flail or stout stick.

Rain or moisture is detrimental to the flowers and seed once they have been gathered and prepared for sale.

The plants will begin to flower about 4 months after sowing, the flowers may be gathered for a month or six weeks, and the seeds will ripen in the course of another month, the time occupied with the crop being altogether from six to seven months.

A trade existed in the dye ["*Cossumba*" or "*Kusumbha*"] as early as 1644 (*see* The English Factories in India 1642–1645, pp. 136, 161, 167, 212).

The imports of Safflower into the United Kingdom 50 or 60 years ago were calculated in tons (405 tons in 1847; 506 tons in 1848; 407 tons in 1849, etc.), the price according to quality being from £1–£8 per cwt., imported from Bombay and Bengal into London and Liverpool in bales of $1\frac{1}{2}$ cwt. (Poole, Stat. Br. Comm. p. 267). In 1894, 401 cwt. value £1742, were imported into England from Madras (4 cwt.) and Bengal (397 cwt.) (Trade of the United Kingdom, 1895, p. 58) and in 1899, 20 cwt., value £62, came in from India (l.c. 1900, p. 167), the last year in which returns are shown by the Customs.

The exports of the dye from India now go mainly to Hong Kong (Watt, Comm. Prod. India, p. 280). For at least 100 years the trade in this substance flourished (see Watt l.c. for some figures), but at the present time the chief value lies in the seed and oil, known in the commerce of this country as "Kurdee," for which upwards of 600,000 acres are cultivated annually in Bombay (l.c. p. 281) in association with wheat or gram. Seed from Nyasaland has been found to contain 29·6 per cent. of oil, nearly equal to the average quality of Indian Safflower seed sold on the London Market value (1913) probably about £7 10s. per ton (Bull. Imp. Inst. xi. 1913, p. 560).

Ref.—"*Carthamus tinctorius*," Field and Garden Crops, Duthie and Fuller, i. pp. 51–54 (Thomason Civil Eng. Coll. Press, Roorkee, 1882)——"*Carthamus tinctorius*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 183–195.——"Carthame," in Les Pl. Industrielles, Heuzé, ii. pp. 342–351 (Libraire Agric. de la Maison Rustique, Paris, 1893).——"Carthame des Teinturiers," in Les Drogues Simples d'Origin Vegetale, Planchon and Collin, pp. 30–32 (Paris, 1896).——"*Carthamus tinctorius*," in Edible Oils used in India, Dunstan, in Agric. Ledger, No. 12, 1899, pp. 32–33; and in Tech. Rep. and Sci. Papers, Imp. Institute, 1903, pp. 128, 131.——"*Carthamus tinctorius*: Safflower," Abbey-Yates, in Agric. Ledger, No. 11, 1904, pp. 149–175.——*Carthamus tinctorius*, Beam, in Report Welcome Res. Lab. Khartoum, 1908, p. 410, Analysis of Seed. ——"*Carthamus tinctorius*," in Comm. Prod. India, Watt, pp. 276–283.——"Edible Oil from Safflower-Seed (*Carthamus tinctorius*)," in Trop. Agric. Ceylon, xxx. Jan. 1908, pp. 41–42.

——"Safflower": "The Economic Significance of Natural Cross-Fertilization in India," Howard, Howard and Rahman Khan, Memoirs, Dept. Agric. India, iii. Oct. 1910, pp. 323–324.—— "Safflower Oil" in Fatty Foods: Their Practical Examination, Bolton and Revis, pp. 245–246, with analyses of the cake and oil (J. and A. Churchill, London, 1913).——"Safflower Seed from Nyasaland," in Bull. Imp. Inst. xi. 1913, pp. 560–561.

Dicoma, Cass.

Dicoma tomentosa, *Cass.*; Fl. Trop. Afr. III. p. 443.

Vernac. names.—Dowda (Katagum, *Dalziel*); Navananji-chapálu (Belgaum, India, *Watt*).

Katagum; Borgu; Kouka [Kukuwa] Bornu; Niger. Found also in Senegambia, Angola, Abyssinia, Mozambique and India.

The plant is very bitter: used as a febrifuge in Belgaum, India (Dict. Econ. Prod. India).

An annual with a shrubby habit ½–2 ft. high. Growing on rocks, Borgu (Barter, Herb. Kew); as a herb of fields, Katagum (Dalziel, Herb. Kew); Zenga do Golungo, and Bumbo, Angola (Hiern, Cat. Welw. Afr. Pl. iii. p. 613).

Lactuca, Linn.

Lactuca sativa, *Linn.*; Fl. Trop. Afr. III. p. 451.

The Lettuce.

Cultivated in Zaria (Parsons, N. Nig. Gaz. April 30, 1910, p. 101), in Lagos (Rowland and Millen, List of Pl. Bot. St. Lagos), in Nubia, Kordofan and Abyssinia (Fl. Trop. Afr. l.c.); throughout India as a cold season garden vegetable for Europeans (Firminger, Gardening in India, p. 164), and in all vegetable gardens of this country. The "Cos" lettuce is extensively cultivated in the province of Szechuan, China, for the stalks which grow to over a foot long and several inches in circumference. They are peeled, sliced, boiled and eaten as a vegetable (Hosie, Rep. Prov. Szechuan, China, No. 5, 1904, p. 15).

An annual plant. The seed, which should be of the best from Europe, may be sown in shallow pans or boxes, or in nursery beds, and pricked off when large enough to handle and finally planted out in light rich soil about a foot apart, shading lightly until established at all stages. In very hot districts, S. Nigeria, Foster recommends (S. Nig. Govt. Gaz. Oct. 21st, 1908, Suppl. p. ii) a light shade of palm leaves. The plants may come to maturity (for cutting) in from about 60–90 days. The two principal kinds grown are "Cabbage" and "Cos." In Cuba the varieties "Hubbard Market" and "Big Boston"—cabbage-headed, fine both for garden and market, "Mignonette" and "Grand Rapids"—crisp bunching, for garden (Austin and Halstead, Bull. No. 13, *seq.* p. 40), "California," "Cream Butter," "Tennis Ball Black-seeded," "Deacon," "Iceberg" and "New York" are specially recommended (Agric. News, Barbados, 1908, p. 319). In Zaria the Cabbage variety is said to do best and to

grow without difficulty with shading when transplanting (Parsons, l.c.). Cabbage and Cos—"Carter's Giant White" are recommended in India (Firminger, l.c.). Tracey (U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 69, 1904) describes 446 varieties cultivated in the United States, classified as "Butter," "Bunching," "Crisp," "Cos" and "Lobed-leaved."

Ref.—"*Lactuca sativa*," in Gardening for India, Firminger, p. 164 (1874).——"Lactucarium," in Pharmacographia, Flückiger and Hanbury, pp. 396–399 (Macmillan and Co., London, 1879).——"*Lactuca sativa*: Garden Lettuce," in Med. Pl. Bentley and Trimen, No. 161, 5 pages (Churchill, London, 1880).——*Lactuca Scariola*, var. *sativa*, in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 578–579.——American Varieties of Lettuce, Tracey, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 69, 1904, pp. 1–103, Plates, i.–xxvii.——"Laitue Cultivée, *Lactuca sativa*," in Les Pl. Potagères, Vilmorin-Andrieux, pp. 349–388 (Paris, 1904); English Translation, Robinson, pp. 360–399 (John Murray, London, 1905).——"Lettuce Culture," Austin and Halstead, in Trop. Agric. xxx. March 1908, pp. 211–213; from Estación Central Agronómica de Cuba, Bull. No. 8, Sept. 1907, ——"Lettuce Cultivation in Agric. News, Barbados, vii. 1908, p. 319.——"Lettuce," in Vegetable Growing in Cuba, Austin and Halstead, Estación Central Agronómica de Cuba (English Edition), Bull. No. 13, June 1908, pp. 38, 40.

PLUMBAGINACEAE.

Plumbago, Linn.

Plumbago zeylanica, *Linn.*; Fl. Trop. Afr. III. p. 486.

Ill.—Rheede, Hort. Mal. x. t. 8; Trew. Pl. Rar. t. 8; Savi. Fl. Ital. iii. t. 108 (*P. auriculata*); Drapiez, Herb. Amat. de Fleurs, ii. t. 31 (*P. auriculata*); Bot. Reg. (1846), t. 23; Wight. Illust. t. 179.

Vernac. names.—Inobiri (Lagos, *Dawodu*); Cadinga puna (Angola, *Welwitsch*); Chitra or Chita (Bengal, *Moloney*).—Ceylon Leadwort.

Katagum (Dalziel, No. 315, 1907, Herb. Kew), and widely spread in Tropical Africa, Asia, Australia, etc.

The root is acrid and stimulating, bruised and mixed with a little bland oil it is used in India as an external application for rheumatism and paralytic affections, etc. (Dict. Econ. Prod. India); medicinal plant, root used as a caustic, Angola (Hiern, Cat. Welw. Afr. Pl. iii. p. 635); a tincture of the root bark has been employed as an antiperiodic in the treatment of intermittents, and as a sudorific (Moloney, For. W. Afr. p. 377).

Subscandent, easily cultivated, found in the bush, Katagum (Dalziel, Herb. Kew), by fences, Loanda (Hiern, l.c.); an undershrub 2–4 ft., Golungo Alto.

Ref.—"*Plumbago zeylanica*," in Dict. Econ. Prod. India, Watt, vi. 1A, 1892, pp. 295–296.

SAPOTACEAE.

Chrysophyllum, Linn.

Chrysophyllum africanum, *A.DC.*; Fl. Trop. Afr. III. p. 500.

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 15 A ff. a–f.

Vernac. names.—Osangbalumo (Yoruba, *Thompson*); Otien (Benin, *Thompson*); Umtuem (St. Thomé, *Welwitsch*); Hagaso (Ivory Coast, *Courtet*); Bungi (Sierra Leone, *Unwin*).

Yoruba, Benin and West Tropical Africa in general.

Fruit edible (Thompson, Col. Rep. Misc. No. 51, 1908, p. 60; List of For. Trees, S. Nigeria, 1910, p. 6), eaten in Dahomey (Chevalier *seq.*).

Wood used for cabinet-work, carving, moulding, and turnery, Ivory Coast (Courtet, Bois, Cote d'Ivoire, in L'Agric. prat. pays chauds. xi. 1, 1910, p. 465); railway carriages (Chevalier, Les Veg. Util. L'Afriq. Trop. Franç. v. 1909, p. 237); for making images and fancy work, S. Nigeria (Thompson, List. l.c.). Courtet and Chevalier (l.c.) give the density as 0·590; a specimen in the Kew Museum has sp. gr. 0·758 = 47·3 lb. per cubic ft. The bark is used medicinally, S. Nigeria (Thompson, l.c.).

The tree yields a gutta-like extract of comparatively little value.

A tree up to 60 ft. high, often planted for shade, Lower Dahomey (Chevalier, Bull. Soc. Nat. d'Accl. de France, 1912, p. 133).

Chrysophyllum albidum, *Don*; Fl. Trop. Afr. III. p. 500.

[*C. Millenianum*, Engler, Monogr. Afr. Pflan. (1904), p. 44].

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 15 C. a–b.

Vernac. names.—Osan-gbalumo (Oloke-Meji, *Foster*); Osan-Agbalumo (Lagos, *Hislop*, *McCleod*, *Dawodu*); Odello (*Goldie*).

Lagos (Millen, No. 47, 1892, Herb. Kew); Oloke-Meji (Foster, No. 107, Herb. Kew); found also in Princes Island (Mann), San Thomé (Don; Chevalier).

The fruit is said to be edible; an extract is obtained from the tree known as birdlime, and the bark is used medicinally, Lagos (Millen, l.c.). The juice from the leaves is used by the natives in place of lime-juice when collecting flake rubber, W. Africa (Goldie, Mus. Kew).

A tree 30 to 60 ft. high (Fl. Trop. Afr. l.c.).

Chrysophyllum Cainito, *Linn.* Sp. Pl. (1753), p. 192.

A tree up to 60 ft. in height. Leaves oval or oblong, about 6–9 in. long, sometimes less; glabrous dark green above, golden pubescent below, in general appearance somewhat like those of Gutta-Percha (*Palaquium Gutta*). Flowers purplish white, corolla campanulate-infundibuliform. Fruit somewhat like and about the size of an apple, about 2–2½ in. in diam. greenish rosy-purple or blue (Grisebach), or white (Lunan), 8–10 seeded, a transverse section of the fruit shows the arrangement of the seeds like a star,

hence the common name. Seeds rhomboidal, black, shining, embedded in the pulp, the central star being about an inch across.

Ill.—Plumier, Ic. Burm. t. 69; Sloane, Voyage, Jamaica, ii. t. 229; Browne, Jamaica, t. 14, f. 2; Jacq. Icon. Select. Stirp. Am. t. 37, f. 1; Plant. Indig. et Exot. Ic. t. 71; Gaertner, Fruct. Sem. Pl. iii. t. 201 (fruit and seeds); Lam. Encycl. t. 120; Desc. Ant. ii. t. 70; Tussac, Ant. iii. t. 9 (*Cainito pomiferum*); Dict. Sc. Nat. t. 63; Bot. Mag. t. 3072 (fruit and seeds from Gaertner, l.c.); Ill. Hort. 1885, p. 127 (fruit); Engler and Prantl, Pflan. iv. pt. 1, f. 80; Engler, Monogr. Afr. Pflan. *Sapotaceae*, p. 40.

Vernac. names.—Bris Chien (Dominica, Mus. Kew).—Star Apple, Broad-leaved Star Apple, Cainito, Caimitier.

Native of the W. Indies and S. America. Cultivated in W. Africa.

Fruit edible. In season (Jamaica) June to September, difficult to transport (Kew Bull. 1888, p. 179). A sample of spirit obtained from Star Apples is in the Kew Museum.

The wood is very hard and durable, suitable for all purposes, especially exposed situations (Harris, Timb. Jamaica, West Indian, Bull. ix. 1909, p. 314). A specimen in the Kew Museum has a specific gravity of 0·82 = 51·25 lb. per cubic foot.

Bark tonic; kernels bitter (Heckel, Les Pl. Med. Toxique, Guy. Franç. Ann. L'Inst. Col. Marseille, iv. 1897, p. 99).

May be propagated by seeds, and has been known in this country since 1737 (Bot. Mag. l.c.).

Ref.—" Caimitier, *Chrysophyllum Cainito*," in Fruits des pays chauds, Hubert, pp. 455–464 (H. Dunod et E. Pinat, Paris, 1912).

Chrysophyllum Welwitschii, *Engler*, Bot. Jahrb. xii. (1890), p. 521.

A slender scandent shrub, climbing to a height of about 25 ft. Leaves evergreen, glossy above, paler below. Flowers, axillary, globose, very small, about 1 lin. in diam. white; corolla gamopetalous, waxy or somewhat fleshy; seeds bony.

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 13, A.

Vernac. names.—Ukopie (Ivory Coast, *Engler*); Jungingi (Golungo Alto, Angola, *Engler*, *Welwitsch*); Jimbundo (Seeds: Golungo Alto, *Welwitsch*); Tingingi (Angola, *Ficalho*).

Forcados (Unwin, No. 59, 1907, Herb. Kew). Also in Angola.

The seeds are worn as ornaments by the natives of Angola (Hiern, Cat. Welw. Afr. Pl. iii. p. 641).

Found in dense forests among the mountains of Eastern Queta, Golungo Alto, where it flowers in Jan. and March, fruiting in September (Hiern, l.c.).

Chrysophyllum sp.

A tree growing 80–100 ft. high (Dawe) and in the Budongo Forest, Uganda (according to Dawe), one of the most striking trees in consequence of its reddish foliage. Branches dark-purple,

tomentellous. Leaves linear-oblong, very shortly and obtusely acuminate, subcuneate at the base, 6–9½ in. long, 1½–3 in. broad, entire, dull green and glabrous above, densely reddish-brown tomentose below; lateral nerves about 20 on each side, spreading, slightly impressed above, prominent below, curved and fading near the margin; petiole 1–1½ in. long, reddish tomentellous. Flowers not seen. Fruits sessile on the young branches, globose, about 2¼ in. in diam. with similar indumentum to that of the under surface of the leaves. Seeds flattened, about ¾ in. long.

Vernac. name.—Ekpuro or Ekpiro (Benin, *Thompson*).

Western Province, S. Nigeria (Thompson, No. 8, 1906, Herb. Kew), Benin (Hitchens, Jan. 1901, Herb. Kew); Budongo Forest, Uganda (Dawe, No. 789, Herb. Kew); Benin, S. Nigeria (Farquhar, Herb. Kew, 1913).

Leaves yield a [so-called] Gutta-percha (Hitchens, l.c.); wood, white (Thompson, l.c.)

LUCUMA, Molina.

Lucuma mammosa, *Gaertn. f.* Fruct. Sem. Pl. iii. p. 129.

A tree about 30 ft. high with a trunk 2 ft. in diam. Leaves chartaceous, obovate-oblong, base cuneate, apex mucronate, glabrous on the upper surface, glabrescent below, about 6 in. by 3 in. Flowers tubular, white or greenish yellow (Peckolt). Fruit ovoid oblong, 3–5 in. long, 2–2½ in. through the centre; rind, russet, rough; pulp, bright red (Peckolt), dark yellowish (Lunan), 5 celled but usually only one-seeded, pericarp somewhat leathery about ¼ in. thick. Seeds large, 2½ in. long 1½ in. broad, somewhat like the fruit in form, covered for three-quarters of the surface with a shining-brown bony testa, about 1 lin. thick; hilum broad, covering the remainder of the seed, lighter than the shining part, though about equal in strength and thickness.

Ill.—Sloane, Hist. Jamaica, ii. t. 218 (*Malus persica*, etc.); Gaertner, Fruct. Sem. Pl. iii. tt. 203, 204; Blanco, Fl. Filip. t. 297 (*Achras Lucuma*); Mart. Fl. Bras. vii. t. 23, f. 2 (seeds); Vidal, Fl. For. Filip. t. 62 D; Le Jard. 1889, p. 271.

Native of S. America and the W. Indies.

Vernac. names.—Sapoti-assi, or Sapoti (Brazil, *Peckolt*); Uique (Indian, S. America, *Peckolt*); Sapote (Trinidad, *Hart*); Mammee Sapote (Jamaica, *Hart*).—Marmalade Plum, Bully Tree.

The pulp of the fruit is edible, though not of the best. It makes excellent marmalade (Lunan, Hort. Jamaic. p. 480). The kernels are stated to contain hydrocyanic acid (Mus. Kew; Hart, Bull. Misc. Inf. Roy. Bot. Gardens, Trinidad, 1895, p. 70); used in the West Indies for flavouring as a substitute for Almonds (Mus. Kew; Kew Bull. 1913, p. 127); prescribed as a remedy for renal colic, Brazil (Peckolt, Pharm. Journ. [3] xviii. 1888, p. 952). The bark is mildly astringent and is used as a febrifuge (l.c.).

The wood is described as suitable for house construction, furniture, etc. (Fawcett, Econ. Prod. Jamaica, p. 50; Harris, Timb.

Jamaica, West Indian Bull. ix. 1909, *Calocarpum mammosum*, Pierre, p. 308).

Propagated by seeds. The tree is cultivated throughout Brazil. The tree appears to take many years to develop. Lunan (Hort. Jamaicensis, p. 481) mentions that "those that plant the stone or seed of these trees never live long enough to eat of the fruit of them, being forty or fifty years, as they say, before they bear."

Achras, Linn.

Achras Sapota, *Linn.*; Sp. Pl. Ed. ii. p. 470.

A tree 30–40 ft. high; sometimes 100 ft. high (Harris, West Indian Bull. ix. 1909, p. 309); with a trunk up to 3 ft. in diameter. Leaves oblong-lanceolate, blunt at both ends, 3–4 in. long, petioles 8–12 lin. long. Flowers white. Fruit a berry, brown or brownish-yellow, firm fleshed, about 2–3 in. in diam., apex blunt pointed, broader and flatter at the base. Seed black, about 1 in. long, $\frac{1}{4}$ in. across the centre.

Ill.—Sloane, Voy. Jamaica, ii. t. 230 (*Anona foliis*, etc.); Catesby, Nat. Hist. Carolina, Florida and Bahama Is. ii. t. 87 (*Anona foliis*, etc.); Browne, Jamaica, t. 19, f. 3 (*Achras fructu*, etc.); Plenck, Ic. t. 277; Jacq. Icon. Select. Stirp. Am. t. 41; Gaertner, Fruct. Sem. Pl. ii. t. 104; Lam. Encycl. t. 255, f. 1; Tuss. Ant. i. t. 5; Desc. Ant. iv. t. 259; Dict. Sc. Nat. t. 61; Bot. Mag. tt. 3111, 3112; Drapiez, Herb. Amat. des Fleurs, vi. t. 434; Spach, Suites (Hist. Nat. des Végétaux), t. 137; Schnizlein, Ic. t. 158; Mart. Fl. Bras. vii. tt. 22, 23, f. 1 (*Sapota Achras*); Vidal, Fl. For. Filip. t. 62 c; Le Jardin, 1889, p. 215; Engler. and Prantl. Pflan. iv. part 1, ff. 72, 73; Engler. Monogr. Afr. Pflan. *Sapotaceae*, p. 21.

Vernac names.—Zapote Chico (Mexico, *Ramirez*); Chictzapotl (Mexico, *Finck*); Rispero (Honduras, *Herrera*); Ya (Yucatan, *Thompson*); Nispero Amarillo (Venezuela, Mus. Kew).——Sapodilla, Sapodilla Plum, Naseberry, La Sapotille, Bullytree, Gum Chicle tree, Milk Apple.

Native of the West Indies and Mexico. Cultivated in many warm countries.—West Africa, West Indies, British Guiana, Central America, Straits Settlements, India, Philippines.

The fruit is edible—described as one of the most delicately flavoured and wholesome fruits grown, Jamaica (Kew. Bull. 1888, p. 179). It is said to stand transport well, especially if picked when full and somewhat green. Fruits have been conveyed successfully from Demerara to the English market (l.c. p. 209).

The wood is very durable and suitable for making furniture, but difficult to work on account of its extreme hardness (Harris, Timb. Jamaica, West Indian Bull. ix. 1909, p. 309). Weight 74 lb. per cubic ft. (l.c.). Specimen in Museum, Kew, has sp. gr. 1·012 = 63·25 lb. per cubic ft.

An extract known as "Chicle Gum" or "Sapodilla Gum" is obtained from the tree—leaves, fruit and bark; it is an important

article of commerce, used in the manufacture of American chewing gum; and the extract, while in a sticky condition is used in Central America as a cement for small articles. Its use for insulating purposes was discussed so long ago as 1876, and on a specimen submitted by Kew to Messrs. Siemens Bros., it was reported that "in mixing with india-rubber it made the latter too brittle and therefore cannot improve the quality of the rubber if intended for the insulation of cable wires" (Kew Report, 1876, p. 18). As showing the importance of the trade in the raw product, "Chicle Gum Concessions" have been granted in Nicaragua (Board of Trade Journ. May 10, 1906, p. 283) and in Honduras (l.c. Dec. 24, 1908, p. 619), the former covering a period of five years and the latter ten years. Canada and the United States are the chief importing centres. The exports from British Honduras in 1911 amounted to 3,219,990 lb., and in 1912, 3,309,277 lb., 72 per cent. being the produce of Mexico and Guatemala (Col. Rep. Ann. No. 784, 1914, p. 11).

A fully grown tree may yield from 30–35 lb. of gum per annum (Sperber, Tropenpfl. xv. 1911, p. 220), or according to another estimate [for Mexico] 3–6 lb. (Dering, Cons. Rep. Misc. No. 401, 1896, p. 13); 3200 fruits or leaves are said to produce each 1 lb. of gum (l.c. p. 12). It is collected by tapping the trunk in the same way as for gutta percha or rubber. In Honduras and Mexico, where the trade is of importance, the V-shaped incision is favoured. It is advisable to tap trees only that are not less than a foot in diameter towards the base. The collection from the trunk in Mexico is carried on in the dry season, and at about the same period of the year [Sept.–Oct.] from the leaves, but from the fruit before it ripens [about March or April] (Dering, l.c. p. 12). The preparation for export consists merely of solidifying the juice by heating in a large pot until it is found to set firm on cooling; before the cooling is complete it may be worked or kneaded and made into blocks. Good samples are white and clean when fresh, but overboiling and age will give the product a reddish colour. The product of certain trees may also vary somewhat in colour, and there appears to be some variation in the trees producing chicle gum. In Mexico the "Zapote Chico" is described as most abundant in the forests and a common tree under cultivation; red and white kinds are distinguished—the "white zapote" said to produce more gum than the "red zapote." The fruits also vary in quality and size (*see* Rose, Useful Pl. Mexico (1899) p. 222; Dering, *seq.*, Pharm. Journ. *seq.*, Cook and Collins, Econ. Pl. Porto Rico (1903) p. 6). Sufficiently complete specimens are not yet available at Kew to decide whether the variation is due to botanical differences or to conditions of soil and climate.

Propagated by seed, cuttings, suckers, or layers; easily grown in good well-drained soil. Requires a tropical climate and average rainfall. It will succeed up to an altitude of from 2000–3000 ft., and in general the cultivation may be regarded as approximately the same as for coffee, with perhaps a greater distance (20–25 ft.) allowed when transplanting to permanent places. The

tree will produce gum about 6 years after transplanting from the nursery. Some trees introduced from the Straits Settlements are reported to have fruited at Old Calabar in 1911 (Johnson, Rep. Agric. Dept. S. Nigeria, 1912 (for 1911), p. 8); cultivated for distribution at Oloke-Meji (Kew Bull. 1908, p. 200) and on the Gold Coast (Tudhope, Pl. and Seeds, Agric. St. 1910, p. 8).

Ref.—"La Sapotille," Bois and Maury, in Le Jardin, 1889, p. 215.——"The Zapote Tree-Chicle," Dering, in Consular Report, Misc. Series, No. 401, 1896, pp. 10–13.——"On Chicle Gum," Butt, in Pharm. Journ. [4] iv. 1897, pp. 328–329, History, Production, and Manufacture.——"Gum Chicle," in Pharm. Journ. [4] xv. 1902, p. 210.——"*Sapota Achras*," in Les Pl. à Caoutchouc, Jumelle, pp. 521–523 (Augustin Challamel, Paris, 1903).——"The Zapote Tree and Chicle Gum (*Achras Sapota*)," Lespinasse, in Trop. Agric. xxvii. Sept. 15, 1906, pp. 229–230.——"Das Chiclegummi und dessen Gewinnung," Sperber, in Der Tropenpflanzer, xv. 1911, pp. 220 223, with illustr. "Chicle gummi-Zapfer"; abstract in Bull. Bureau of Agric. Intell. Inter. Inst. Agric. Rome, April, 1911, pp. 889–890.——"Chicle or Sapodilla Gum," in Bull. Imp. Inst. ix. 1911, pp. 147–148.——"Sapotillier, *Sapota Achras*," in Fruits des pays chauds, Hubert, pp. 628–631 (H. Dunod et E. Pinat, Paris, 1912).

Synsepalum, Baill.

Synsepalum dulcificum, *Daniell*, in Pharm. Journ. [1] xi. 1852, p. 445. [*Sideroxylon dulcificum*, A.DC. Fl. Trop. Afr. iii. p. 503].

Ill.—Daniell, in Pharm. Journ. [1] xi. (1852), p. 447; Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 7. f. c.

Vernac. names.—Agbayun (Lagos, *Dawodu*); Agbahuyu (W. Africa, *Daniell*); Assarbah (Fantee, *Moloney*); Tam Assurba (Sierra Leone, *Scott Elliot*); Tahme (Accra, *Moloney*).—Miraculous Fruits of West Africa.

Lagos (Moloney, 1889, Herb. Kew), Yoruba, Old Calabar River Gold Coast; Sierra Leone; Dahomey, etc.

The fruits when ripe and fresh are singularly sweet and have the peculiar property of imparting a sweet taste to anything bitter, sour or acid in character—lime juice, vinegar, unripe fruit, quinine, etc., eaten immediately afterwards. The natives use them to sweeten palm wine (Daniell, l.c. p. 445); the value of the fruits seems to be well known locally, in Coomassie (Bowdich, Daniell), Aburi (Johnson).

Fruit single seeded, from which it may be propagated. Grows about 6 ft. high (Fl. Trop. Afr. l.c.) or tree near Aburi (Johnson, Herb. Kew). In flower June–August (Daniell, Pharm. Journ. l.c. p. 447), fruiting in January, Mbiakom, Old Calabar River.

Sideroxylon longistylum, Baker, Fl. Trop. Afr. iii. p. 562, "Kafe" of Sierra Leone (Scott Elliot) is a closely allied species, with edible fruits.

Ref.—"On the *Synsepalum dulcificum*, or Miraculous Berry of Western Africa," Daniell, in Pharm. Journ. [1] xi. 1852, pp. 445–448.——"Miraculous Fruits of West Africa, (*Sideroxylon dulcificum*)," Hillier, in Kew Bull. 1906, p. 171.

Palaquium, Blanco.

Palaquium Gutta, *Burck* in Ann. Jard. Buitenzorg, v. (1885) p. 24.

A tree, 100–200 ft. high, 4–5 ft. in diam. when fully grown, with buttresses 6–8 ft., extending at the base 4–5 ft. from the trunk (Wray). Leaves coriaceous, obovate or obovate-oblong, base cuneate, apex shortly acuminate, glabrous green on the upper surface, golden silky pubescent on the under side, 3–5 in. long $1\frac{1}{2}$–$2\frac{1}{2}$ in. broad; petiole 1–$1\frac{1}{2}$ in. long. Inflorescence in the axils of the leaves, flowers in fascicles of about 4–5, corolla white, six petals, rotate–campanulate. Fruit a berry with a downy pubescence similar to that on the under side of the leaves, $\frac{1}{2}$–$\frac{3}{4}$ in. in diam. six-ovuled though only 1–2 seeded when mature. Seeds, longer than broad, ends rounded, testa shining, except for the hilum covering nearly one-half the whole surface. *Dichopsis Gutta*, Benth. in Benth. and Hook. Gen. Pl. ii. (1876) p. 658.

Ill.—Hooker, Kew Journ. Bot. vi. t. 16 (*Isonandra Gutta*); Miquel, Fl. Ned. Ind. Bat. ii. t. 36A (*Isonandra Gutta*); De Vriese, De Handel in Getah-Pertja, p. 32, p. 46 (*Isonandra Gutta*, var. *oblongifolia*); Ann. Jard. Bot. Buitenzorg, v. 1886, t. 4, t. 5 (*Palaquium oblongifolium*); Bentley and Trimen, Med. Pl. t. 167 (*Dichopsis Gutta*); Baillon, Hist. Pl. xi. p. 264, ff. 296, 297; Engler and Prantl, Pflan. iv. pt. 1, f. 71; Obach, Cantor Lectures on Gutta Percha (1898) p. 8, f. 1 (*Isonandra Gutta*); p. 9, f. 2 (fl. diag.); p. 10, f. 3 (habit of tree Botanic Garden, Singapore), p. 11, f. 4 (*P. Gutta*), f. 5 (*P. oblongifolium*); Köhler, Med. Pflan. iii. (*P. Gutta* and *P. oblongifolium*); Journ. Soc. Nat. Hort. France, iii. 1902, p. 355, f. 17 (young plants in pots); Sherman, Gutta Percha, Philippines, Dept. of the Interior, Manila, Bull. No. 7, 1903, ff. 2, 14 and 26–27, 29; Jumelle, Pl. Caoutchouc (1903) p. 477, f. 53 (*P. Gutta*), p. 480, f. 54 (*P. oblongifolium*); Engler, Monogr. Afr. Pflan. *Sapotaceae*, p. 20, f. 6.

Vernac. names.—Gutta Taban, Taban Merah (Malay, *Gamble, King, Wray*).—Gutta Percha.

Native of Malaya, cultivated in the Straits Settlements, Java, distributed to many British Colonies in the Tropics from Kew, including S. Nigeria.

The fruit is edible and sweet, though said to have a disagreeable flavour of gutta-percha. Both fruit and seeds are eaten by birds, squirrels, monkeys, etc.

The kernels contain an oil used for cooking purposes in Malaya. According to Berkhout (India Rubber Journ. April 6, 1908, p. 373), *Palaquium* seeds contain 50 per cent. of solid fat, worth (1905) about Rs. 400 per ton, though later it is stated that "about 750 kilos of dried seeds were sent to an English soap boiler, but

the sum realised proved too small to make it worth while to continue sending them."

The importance of the tree lies in the extract "Gutta Percha" used for insulating which is durable under water—used for telegraph and telephone wires, deep-sea cables, for making waterproof soles for boots, golf balls, etc.

The substance is readily distinguished from "Balata" (*Mimusops*) or "Rubber" (*Hevea*, etc.) by becoming plastic on exposure dry to a temperature of about 100° F. (the actual temperature at which it becomes plastic depends chiefly on the relative proportions of gutta and resin) or by immersion in hot water. It is tough like Balata and Rubber, but has not the elasticity of either and is not so serviceable for manufactures or in situations exposed to light and air, becoming more or less brittle. Under water or in the dark it is said to preserve its original character almost indefinitely.

Gutta Percha is one of the noted discoveries which marked the progress of the 19th century. The historical details (see the references below) are as remarkable as those of Para Rubber, though the tree does not appear to have met with the same success under cultivation, and Java is the only place in the world producing gutta percha on a commercial scale from cultivated trees.

Plants may be propagated from fresh seeds, raised in nursery beds or in bamboo pots. They may be transplanted to permanent places when about a foot or so high at from about 12–15 ft. apart each way. Light shading in the nursery and until established in the plantation will be required. Marcottage and cuttings have also been recommended as means of propagation.

The main requirements are a rich loamy soil, moist but well drained, sheltered position, good rainfall and an average temperature of about 80° F. According to Sérullas (Some Facts concerning Gutta Percha, p. 3) the tree will not grow near the sea nor at a height of more than 200 ft. above sea-level, nor near stagnant water, it requires constant humidity, is almost exclusively found in shallow ravines where the soil is of a compact clay and where the roots can seek running water. At Tjipetir, Java, however, *Palaquium Gutta* has been grown successfully at 1300 ft. (Obach, Cantor Lectures on Gutta Percha, p. 18).

Trees may be tapped when about 10 years old. According to Burn-Murdoch (see Agric. Bull. Str. Sett. vii. Sept. 1908, p. 389) the rate of growth of forest trees in the Malay States is in some instances 1·69 inches per annum or 42 years to reach a girth of 6 ft. at 6 ft. from the ground, in others the rate of increase has varied from 3–20 or 24 in. in 7 years, the girth increment being greater as the crown of the tree reaches the light. According to Sérullas (l.c. p. 5) the tree is not fully grown till 28 or 30 years of age; when it commences to flower and so continues every two years; and when mature the trunk is about 3 ft. in circumference at about 5 ft. from the ground, yielding under ordinary circumstances about one-third of a pound of sap. A tree sent out from

Kew, planted at Old Calabar in August 1900 is reported to have flowered January 1909.

The yield from felled trees is naturally much greater than from standing trees, because the fallen tree can be tapped to the fullest extent, but this—a purely native method—has led almost to the extinction of the tree, and is not recommended (Kew Bull. 1891, pp. 234–235).

General information on tapping is given under *Funtumia elastica* and Para Rubber (*Hevea brasiliensis*), and the methods are similar for Gutta Percha. The best time for tapping is said to be soon after the rainy season is over (Collins, Journ. Soc. Arts, xxxii. 1884, p. 206).

Estimates of the quantity of solid extract are very variable; from trees about 15–17 years old (plantation experiments by Van Romburgh) the yield was 100 grammes or nearly one-fifth of a lb. per tree (Sherman, Gutta Percha, p. 31); 2 lb. 5 oz. from a "Taban Merah" at least 100 years old (Wray, Journ. Asiatic Soc. Str. Branch, 1884, pp. 212, 214; Kew Bull. 1891, p. 235); 11 oz. from adult trees in West Sumatra (Burck); 2–3 lb. from a well grown tree of the first or best variety, and 50 or 60 lb. from trees 100–140 ft. high (Collins, Journ. Soc. Arts, xxxii. 1884, p. 206). Trees 30–35 years old are said to yield 2–3 lb. of Gutta under the destructive native method of tapping (Gamble, Man. Ind. Timb. p. 445)

The above refers to extract from the trunk, but it is possible to obtain a substantial amount from the green and dry leaves. In the Museum at Kew there are some fine samples of Gutta Percha from the leaves of trees grown at Tjipetir, Java, and at Singapore.

There are two processes—the mechanical and chemical—by which it may be recovered from the leaves and young branches, both are fully discussed in Kew Bull. No. 57, Sept. 1891, pp. 231–239, and No. 125–126, May and June, 1897, p. 200. In the former method the dry leaves are ground to powder after being moistened with hot water, the powder is then washed in tanks of water until the gutta floats, when it is collected, and afterwards pressed and moulded in warm water. In the chemical process the gutta is extracted from the powdered leaves by means of a volatile solvent such as carbon bisulphide. The production of gutta from the leaves in Malaya seems to have been fairly successful, though it was expected in 1896, that the difficulty of procuring leaves in Singapore would sooner or later stop the trade (Kew Bull. 1897, p. 200). Leaves have been exported in the dry state from Singapore, Sumatra, Borneo, etc., to factories in Europe—Brussels, Orleans, Paris, and treated by chemical means yielded a useful product, though of inferior quality. It is considered better to treat the leaves while green and by other than chemical processes in order to avoid oxidation and changes in structure (*see* the India Rubber Journ. Oct. 30th, 1899, *Isonandra Hookeri*). In 1913 it is reported (Suppl. to F.M.S. Govt. Gaz. 1914, "Forests," p. 16) in the Malay States that 32 pikuls

[4266 lb.] of leaves were collected for which royalty was paid. The price obtained for gutta-percha obtained by tapping was 3s. 6½d. per lb., but the profit was considered very poor compared to that of leaf collection. An experiment in extracting it from the crushed bark (made by the India Rubber Gutter Percha and Telegraph Works Co., Ltd., Silvertown) in 1886, showed that the material recovered was practically useless commercially, as it contained too high a proportion of brittle resin, though the total extract obtained was 13·6 per cent. of the dry bark (Kew Bull. 1891, p. 237).

Gutta Percha is now valued at about 3s.–4s. per lb. It is imported chiefly from the Straits Settlements and Dependencies. The Customs returns show imports of Gutta Percha with those of Balata obviously included, and for convenience the figures are given as published, but it may be safely stated that the returns from British Guiana, Venezuela, and contiguous countries are entirely those of Balata. The total amount imported in 1912 was 57,456 cwt. value £745,050, which included 17,638 cwt. value £153,301 (Str. Sett. and Dependencies including Labuan), 17,271 cwt. value £254,517 (Venezuela), 5549 cwt., value £98,614 (B. Guiana), 5478 cwt. value £110,035 (Dutch Guiana), and the remainder from Germany, Netherlands, France, U.S. America, B.W. Indies, other Brit. Possessions and Foreign Countries (Trade of the Unit. Kingdom for 1912, Vol. i, 1913, p. 121).

Ref.—"Botanical Characters of a New Plant (*Isonandra Gutta*) yielding the Gutta Percha of Commerce," Hooker, in London Journ. Botany, vi. 1847, pp. 463–465; Reprint in Pharm. Journ. [1] vii. pp. 179–181; Transl. "Sur le Gutta Percha et la plante qui le produit," in Ann. Sc. Nat. Series 2, viii. pp. 193–195.——De Handel in Getah Pertja (Gutta Percha), De Vriese, pp. 1–46 (Te Leyden, Bij A. W. Sythoff, 1856).——"Gutta Percha," in Kew Report, 1881, pp. 38–47.——Origines botaniques de la Gutta Percha, Beauvisage, pp. 1–66 (Paris, 1881).——"Gutta Percha," in Spons' Encycl. Industr. Arts, pp. 1652–1654 (E. & F. N. Spon, London, 1882).——"Gutta Percha," in India Rubber Journ. Nov. 5, 1884.——"Gutta Percha," Its History, Commerce and Supply, l.c. March 4th, 1885, pp. 197–199.——Rapport du Docteur W. Burck. . . A la Recherche des Espèces d'Arbres qui produisent la Gutta-percha, pp. 1–57 (Imprimerie Coloniale, Saigon, 1885).——"Origin Bot. de la Gutta Percha, Burck, in Ann. Jard. Bot. Buit. 1885, pp. 1–80.——"*Dichopsis Gutta*," in Med. Pl. Bentley and Trimen, No. 167, 5 pages.——"*Dichopsis Gutta*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 103–106.——Some Facts concerning Gutta Percha, reprinted from the Electrical Review, London, Dec. 1890, and Jan. 1891, pp. 1–22, from an article by M. Sérullas in La Lumiere Électrique.——"Rediscovery of Gutta Percha Tree at Singapore (*Dichopsis Gutta*)," in Kew Bull. 1891, pp. 230–231.——"New Process for Recovering Loss of Gutta Percha," l.c. pp. 231–239.——"Indian Gutta Percha," l.c. 1892,

pp. 296–297.——"The Chemistry of Gutta Percha," Sharpe in India Rubber Journ. Feb. 8th, 1893, pp. 193–195.——"Extraction of Gutta Percha from Leaves," Kew Bull. 1897, p. 200.——"Gutta Percha," Obach, in Journ. Soc. Arts, xlvi. 1897, pp. 97–114; pp. 117–133; pp. 137–164; pp. 169–197; Reprints–Cantor Lectures on Gutta Percha, pp. 1–102 (Soc. of Arts, 1898), and Die Gutta Percha, pp. 1–114 (Dresden-Blasewitz, 1899).——"Gutta Percha," in Kew Bull. 1898, pp. 139–141: particulars of prices, yield from leaves and propagating.——"*Palaquium Gutta*," in Les Pl. à Caoutch. et à Gutta, Jumelle, pp. 131–143, including *P. oblongifolium* (A. Challamel, Paris, 1898).——"*Palaquium Gutta*," in Medizinal Pflanzen, Köhler, iii. 2 pp., "*Palaquium oblongifolium*," l.c. 2 pp., "Gutta Percha," l.c. 4 pp.——"Gutta Percha (Gutta Taban)," etc., in All about Rubber and Gutta-Percha, Ferguson, pp. 9–17, and "Collection and Preparation of Gutta-Percha," l.c. pp. 70–71 (H. M. and J. Ferguson, Colombo, 1899).——"La Gutta-Percha," in Revue des Cultures Coloniales vii. 1900, pp. 678 688 and pp. 716–724.——"Die Kabelfrage und die Guttaperchakultur," Schumann, in Der Tropenpflanzer, iv. 1900, pp. 333–340.——"Guttaperchakultur in Kamerun," Warburg, l.c. pp. 340–342.——"Gutta-Percha in Dutch India," in the India Rubber Journal, Sept. 30th, 1901, pp. 253–254, Transl. from the "Gummi-Zeitung."——"Reisebericht der Gutta Percha—und Kautschuk Expedition nachden Südsee—Kolonien," Schlechter, in Der Tropenpflanzer, v. 1901, pp. 318–329; pp. 372–382; pp. 457–471; pp. 539–543; vi. 1902, pp. 22–30; pp. 213–234; pp. 394–402.——"Guttaperchakultur in Kamerun," Warburg, l.c. vi. 1902, pp. 561–564; "Über Vorkommen und Kultur des Guttapercha," Burchard, l.c. vi. 1902, pp. 112–119.——"Multiplication du *Palaquium Gutta*," Demilly, in Journ. de la Soc. Nat. d'Horticulture, France, iii. 1902, pp. 354–356.——"La Gutta-percha et le Caoutchouc en Malaisie," in L'Agric. prat. pays chauds, ii. 1902–03, pp. 586–603.——"La Gutta-Percha en Nouvelle-Guinée, D'Abbans, in L'Agric. prat. pays chauds, iii. 1903–04, pp. 491–492, *Dichopsis oblongifolia*, etc.——The Gutta Percha and Rubber of the Philippine Islands, Sherman, Bull. No. 7, 1903, Dept. of the Interior, Bureau Govt. Laboratories, Manila, pp. 1–43, plates 1–41, with map (from Obach's "Gutta Percha") showing distribution of *Palaquium*.——"Importance de l'analyse chimique pour la culture des arbres à gutta-percha," van Romburgh and Tromp de Haas, in Bull de l'Inst. Bot. de Buitenzorg, xv. 1902, pp. 17–28.——"La Culture des Arbres à gutta et la sélection chimique," in Journ. D'Agric. Tropicale, iii. 1903, pp. 11–13, Abstract of preceding.——"The Chemical Analysis of Gutta Percha as a Guide in Its Cultivation and Valuation," in Bull. Imp. Inst. i. 1903, pp. 30–32.——"Gutta-Percha from the Straits Settlements," l.c. ii. 1904, pp. 14–21.——"Gesetzgebung der Britischen Kolonial gebiete in bezug auf Guttapercha: Gewinning und Export," Fuchs, in Der Tropenpflanzer, viii. 1904, pp. 679–683.——"Some Facts about Gutta Percha," Burn-Murdoch, in

Indian Forester, xxxi. 1905, pp. 309–320, plates xxx.–xxxii. ——"Zur Gutta-percha Kultur auf Java," Büsgen, in Der Tropenpflanzer, ix. 1905, pp. 193–194.——"Uber Kautschuk— und Guttapercha Kultur in Deutschen Kolonien," Preuss, l.c. pp. 297–307.——"Rentabilitat einer Guttaperchapflanzung für Privat Kapital, Kolbe (Neuguinea), l.c. pp. 519–525.——"Gutta Percha Producing Species," Ridley, in Agric. Bull. Str. Sett. and Fed. Malay States, v. March 1906, pp. 61–64.——A compilation of Notes on India Rubber and Gutta Percha, Ahern, Bureau of Forestry, Philippines, Bull. No. 3, 1906, pp. 1–4, with map of the Philippines showing distribution of Rubber and Gutta percha. ——"Gutta Percha Trees of the Malay Peninsula," Gamble, in Kew Bull. 1907, pp. 109–121.——"The Cultivation of Gutta Percha in Java," Berkhout, in The India Rubber Journal, April 6th, 1908, pp. 373–374.——"Gutta-Percha," in Comm. Prod. India, Watt, pp. 625–628.——"Die Staatlichen Guttaperchapflanzungen": in Bericht über eine Reise nach Britisch— und Niederländisch—Indien, Deistel, in Der Tropenpflanzer, xii. 1908, Beihefte, No. 2, April 1908, pp. 77–82.——Kautschuk, Gutta Percha and Balata in Unsere Kolonialwirtschaft in Ihrer Bedentung für Industrie und Arbeiterschaft, l.c. xiii. 1909, Beihefte, No. 2, March 1909, pp. 57–63.——Die Analyse des Kautschuks, der Gutta-percha, Balata und Ihrer Züsatze mit Einschluss der Chemie der Genannten Stoffe, Ditmar, pp. 1–288, illust. (A. Hartlebens Verlag, Wien und Leipzig, 1909).——"Cultivation of Gutta Percha," in India Rubber Journ. Dec. 13, 1909, pp. 693–694.——"Gutta Percha," in The India Rubber World, Jan 1, 1913, pp. 192–194.

Omphalocarpum, P. de Beauv.

Omphalocarpum elatum, *Miers* in Trans. Linn. Soc. Series 2, i. p. 16 [*O. procera*, Oliv. Fl. Trop. Afr. i. p. 171, *non* Beauv.; *O. Radlkoferi*, Pierre, ex Engler, Monogr. Afr. Pflan. *Sapotaceae* (1904), p. 16].

Ill.—Trans. Linn. Soc. Series 2, i. t. 4; Engler, Monogr. Afr. Pflan. *Sapotaceae*, p. 16, f. 4 (*O. Radlkoferi*), tt. 4, 5 (*O. Radlkoferi*).

Vernac. name.—Fidroh (Timineh, *Mann*).

Old Calabar (Thomson): Oware; Bagroo River; Cameroon.

Yields a latex used to adulterate that of good rubber (Col. Rep. Misc. No. 51, 1908, p. 39).

The wood is light brown in colour, weight 35 lb. per cubic ft. (sp. gr. of a specimen in the Kew Museum collected by Mann, Cameroons, 0·558), moderately hard and close grained. Bark $\frac{1}{16}$ in. thick—on a section $5\frac{1}{2}$ in. in diameter.

Found as a tree 60–80 ft. high, Cameroon River (Mann, No. 712, Herb. Kew).

Omphalocarpum procerum, *Beauv.* in Fl. Owar. Benin, I. p. 7.

A tall tree 60–80 ft. high with spreading branches. Leaves

alternate, sessile, lanceolate, entire, glabrous, shining above. Flowers solitary or many in clusters, sessile, arising from the trunk; sepals 10; corolla lobes 6–7, long clawed. Fruit very large, 6–12 in. in diam. indehiscent, orbicular, very strongly depressed, more or less grooved, deeply umbonate, pericarp thick, woody when dry, many seeded. Seeds oblong, compressed, 1 in. long, ½ in. broad. (Trans. Linn. Soc. Series 2, i. 1895, p. 15).

Ill.—Pal. de Beauv. Fl. Ow. Ben. i. tt. 5, 6; Lam. Encycl. t. 966; Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 3, f. B.

Vernac. name.—Otimbalilo? (W. Africa, *Christy*).

Oware, S. Nigeria (Palisot de Beauv. l.c.).

There is no specimen of this tree in the Herbarium at Kew, and it is not unlikely that all the specimens seen in this country belong to the former species, and so also the information contained in the reference at foot, though this may apply equally to both species. Omphalocarpum fruits first attracted attention about 30 years ago when a few were imported into Liverpool from West Africa, said to produce a bird-lime like substance (Pharm. Journ.).

The fruits when freshly cut from the trunk exude a sticky substance which disappears as it gets dry.

Rep.—"Proximate Analysis of the Fruit of *Omphalocarpum procera*," Naylor, in Pharm. Journ. [3] xii. 1881, pp. 478–480, and pp. 488–489; abstract in New Comm. Pl. and Drugs, Christy, No. 5, 1882, pp. 54–55.

Bassia, Koenig.

Bassia butyracea, *Roxb.* in Asiatic Res. viii. (1805), p. 477.

A deciduous tree up to 70 ft. high. The branchlets from the underside of the leaves to the petioles and pedicels covered with fine silky pubescence. Leaves large, 12 in. long 6 in. broad, or smaller in those crowded near the ends of the branches, subobtuse, rhomboid at the base. Flowers with 8–10 corolla lobes, 5 calyx segments. Fruit a berry, nearly round, about 1 in. in diam., fleshy, 1–3 seeded. Seeds about 1 in. long and ½ in. broad, brown, smooth and shining, except for the hilum about ¾ in. long and ¼ in. broad in the centre or widest part. Outer shell thin, easily broken after removal of the kernel which cut through the centre crosswise is oval in section ¼ in. by ⅜ in.

Ill.—Roxburgh in Asiatic Researches, viii. t. 1; Brandis, Illustr. For. Fl. India, t. 35.

Vernac. names.—Phalwara (*Gamble*).—Butter Tree of India.

Native of India.—Introduced to Botanic Garden, Old Calabar, from Kew in 1896.

The seeds yield an oil or fat used in India for cooking, burning in lamps; medicinally—for rheumatism, etc.; as hair oil, ointment, for soap-making, and is suitable for making candles (Watt, Comm. Prod. India, p. 118). In consistency it resembles "Shea butter" or rendered lard, and would in general be suitable for similar purposes. The yield of fat from the kernels is from

60–65 per cent. (Hooper, Agric. Ledger, No. 5, 1911–12, p. 152), 66 per cent. (Bolton and Revis, Fatty Foods, p. 188), and according to Watt (Comm. Prod. India, p. 120) it is usually regarded as more valuable than that of either *B. latifolia*, Roxb., *B. longifolia*, Linn., or *B. malabarica*, Bedd., chiefly because it solidifies almost immediately after being expressed from the seeds.

The bark is used in Sikkim to poison fish (Gamble, Man. Ind. Timb. p. 449; Mus. Kew).

Ref.—"*Bassia butyracea*," in Dict. Econ. Prod. India, Watt, i. 1889, pp. 405–406.——"*Bassia butyracea*," in Comm. Prod. India, Watt, pp. 116–120, including general information on all the above species.——"Bassia Kernels and Fats," in Bull. Imp. Inst. ix. 1911, pp. 228–236, and in Col. Rep. Misc. Series, No. 88, 1914, pp. 544–554, with analyses.

Butyrospermum, Kotschy.

Butyrospermum Parkii, *Kotschy*; Fl. Trop. Afr. III. p. 504.

Ill.—Park. Travels Int. Afr. p. 352; Kotschy, Pl. Tinneanae, t. 8B; Kotschy, in Sitzb. Akad. Wiss. Wien, 1. (1864), t. 1 (*Butyrospermum niloticum*); t. 2 (*B. Parkii*); Trans. Linn. Soc. xxix. (1875), t. 73 (*Bassia Parkii*); Engler and Prantl, Pflan. iv. pt. 1, f. 74; Heckel, Ann. Inst. Col. Marseille, iv. 1897, ff. 5, 6, 7; also in Rev. Cult. Col. i. 1897, p. 194, f. 1 (habit), p. 195, f. 2 (small branch), p. 197, f. 3 (young fruit and sections of seeds and flowers); Jumelle, Pl. Caoutchouc, (1898), p. 163 (habit); Ann. Inst. Col. Marseille, ix. 1902, t. 4; Engler, Monogr. Afr. Pflan. *Sapotaceae*, p. 23 (var. *niloticum*); Pobéguin, Fl. Guin. Franç. t. 65 (Karité en fleurs); Karst. & Schenck, Veg. bild. iv. tt. 10, 28 (habit); Perrot, Les. Vég. Util. L'Afriq. Trop. Franç. Fasc. ii. p. 29, f. 1 (var. *mangifolium*); p. 33, f. 2 (var. *Poissoni*); Notizbl. Bot. Gart. Berlin, App. xxii. 1910, p. 113; Thompson, Col. Rep. Misc. No. 66, 1910, t. 19; Engler and Drude, Veg. Erde, ix. p. 774, f. 657 (var. *niloticum*).

Vernac. names.—Emi-Ori, Emigidi (Yoruba, *Thompson*); Emi (Lagos, *MacGregor, Phillips, Dawodu*); Kadainya (Hausa, *Dudgeon*); Nku (Ashanti, *Thompson*); Ya (Nile, *Dawe*); Eya (Acholi, Uganda, *Dawe*); Lulu (Sudan, Col. Rep. Misc. No. 88, 1914, p. 541); Bambuk (Sierra Leone, *Scott Elliot*); Meepampa (Madi, *Grant*); Somu (Togoland, *Engler*); Shea Toulou (Niger, *Park*); Karité (French W. Africa, *Perrot, Chevalier, Planchon, Noury, Ammann, Henry*); Karité or Karé (F.W. Afr. *Pobéguin*). —Shea Butter, Beurre de Karité, Beurre de Galam, Bambouk butter, Gutta Shea.

Lagos, Abeokuta, Nupe, Zungeru, Jeba, Borgu, Zaria, Hasarawa in Nigeria, and extending westwards to Togoland, Dahomey, Gold Coast, Bambarra, etc., eastwards to the Nile land—Gondokoro, Madi, Djurland and the Niam-Niam country.

The wood is exceedingly hard and heavy; a specimen in the Museum, Kew, has a specific gravity of 0·929 = 58 lb. per cubic ft.—the bark on the specimen varied from $\frac{5}{8}$–$\frac{1}{2}$ in. in thickness,

otherwise the wood should sink in water. Used for making mortars, bowls and the branches for houseposts, Yoruba (Thompson, List of For. Trees, S. Nig. 1910, p. 6). The bark is used medicinally by the natives (l.c.). The fruit is edible, but the main value of the tree lies in the seeds or "Shea nuts."

The kernels yield about 50 per cent. of fat known in commerce as "Shea Butter," as exported from the Niger, and the oil extracted from the kernels in this country is known as "Shea Nut Oil." The residue after the extraction of the butter is used by the natives to smear on their mud huts to keep out the rain (Bull. Imp. Inst. 1913, p. 156). Meal from the nuts of Shea butter (said to come from Nigeria) crushed at Antwerp, was being offered in Liverpool, 1910. It has a somewhat acrid taste and it is doubtful whether cattle would eat it unless disguised by other foods. The fat is used for making candles and to a smaller extent in soap manufacture. Of latter years it has found a use in the manufacture of substitutes for butter more especially on the Continent, and it has been suggested as a substitute for tallow as used in sizing cotton cloth. Locally it is used by the natives for food, for rubbing on their bodies, and for lighting purposes.

In preparing the butter, the outer pulp of the fruit is first removed and the nuts dried in the sun or by the aid of artificial heat. The outer shell is taken off and the kernels after further drying are braised and boiled, the fat being skimmed off the surface somewhat in the same manner as for the extraction of palm oil. The oil as it cools solidifies like lard, pure white or tinted according to the method of preparation. The dried kernels are sometimes imported into Europe and there is comparatively little difference in the fat as imported and that extracted from the dried kernels. Analyses made at the Imperial Institute show Acid value 18·0, Saponification value 179·0 and Iodine value per cent. 58·0 for Shea butter from Lagos; 10·3, 181·7, 54·0, respectively, for fat extracted from nuts as imported by the Niger Company (Govt. Gaz. S. Nigeria, Jan. 22nd, 1908, p. 66).

A sample of Shea butter from Lagos in the Museum, Kew, was valued at £24 per ton in 1900 (by Messrs. John Knight and Son, Silvertown Soap Works and Oil Mills, London); a considerable demand was expected if it were continuously put on the market, but so far as could be ascertained at that time there had been none offering since 1896 when only a small parcel was sold. A sample of Shea butter from S. Nigeria was valued in 1907 at £27 5s.–£27 10s. (Col. Rep. Ann. No. 583, 1908, p. 37), and one from the Gold Coast in 1912 at £28 5s. in Liverpool (l.c. No. 778, 1913, p. 33). Sample lots of well dried nuts have been bought in Ogbomoso and Tengba at the rate of about £4 per ton (Govt. Gaz. S. Nigeria, Feb. 9th, 1910, p. 198). Kernels from Uganda and the Gold Coast were valued in Liverpool (1912) at £10 10s. per ton (Col. Rep. Ann. No. 778, 1913, p. 33).

The exports of "Shea Butter" were, in 1909, 691,219 lb. value £5230 (S. Nigeria); 244,160 lb. value £2188 (N. Nigeria), in 1910, 761,102 lb., value £6804 (S. Nigeria), 230,513 lb., value

£2063 (N. Nigeria); and of "Shea Nuts," in 1909—21,790,787 lb., value £78,029 (S. Nig.); 20,352,640 lb., value £90,858 (N. Nig.); in 1910—9,998,870 lb., value £43,510 (S. Nig.); 9,400,201 lb., value £41,080 (N. Nig.; Govt. Gaz., S. Nig. 17th May, 1911, Suppl. App. B and D).

Shea Nuts were selling in Liverpool at £13 per ton, Oct. 1913 (Oil and Colour Trades Journ. Oct. 25, 1913, p. 1483). The total of Shea Products exported from Lagos in 1913 was 206,892 lb. value £865 (190,180 lb., value £643 to United Kingdom; 16,712 lb. value £222 to other countries not specified); in 1914—3,012,021 lb., value £10,995 (35,777 lb., value £922, to United Kingdom; 2,966,130 lb., value £9918 to Germany, and 10,114 lb., value £155 to other countries) (Nigerian Customs and Trade Journ. Feb. 2, 1914, p. 66). The remarkable increase to Germany in 1914 (nil in 1913) is significant as showing the increasing importance and the possible developments in the trade.

As indicated (p. 413) the Northern part of the Colony is the more important for the production. The Western and Central Provinces are the sources of the supply in S. Nigeria, no returns being given for the Eastern Province. The trade lies chiefly with the United Kingdom, Germany and Holland, and the demand at the present time is apparently more for the nuts than for the butter.

"Gutta Shea" is a hydrocarbon obtained from Shea butter in the manufacture of soap to the extent of ·5–·75 per cent. (Henderson and Co., Glasgow, Mus. Kew; Kew Report, 1878, p. 38; Kew Bull. 1906, p. 177). This is probably analogous to the gutta-like extract that may be obtained from the trunk, known according to Dudgeon (Agric. and For. Prod. W. Afr. p. 123) as "Danko Kadainya" in Kano. This extract is of doubtful value commercially and in any event it could not be obtained without detriment to the tree and affecting indirectly the production of the fruit for butter. The yield from wild trees may vary according to size from $1\frac{3}{4}$ lb.–85 lb. of dry nuts (Journ. D'Agric. Tropicale, 1912, p. 283; Bull. Imp. Inst. 1913, p. 156).

Found in a wild state as a tree 30–40 ft. with a trunk 5–6 ft. in diameter (Fl. Trop. Afr. l.c. & Kew Bull. 1906, p. 177); abundant in Borgu, N. Nigeria (Lugard, Col. Rep. Ann. No. 476, 1905, p. 75), [where there is a small leaved form referred to by Barter (No. 721, Herb. Kew) which he states flowers 3 weeks before the ordinary tree]; in Ilorin, N. Nigeria (Lugard, Col. Rep. l.c. p. 91); throughout the country [N. Nigeria] (Elliott, l.c. p. 132). Plentiful between Iwo and Ede, W. Province, in dry forest on poor rocky soil (Thompson, Col. Rep. Misc. No. 51, 1908, p. 6), in the belts of forest clothing the bolder hills north of the Cross River E. Province (l.c. p. 7), in the Oyo Shaki and Meko districts W. Province (l.c. p. 41) and one of the most valuable trees in the dry zone, S. Nigeria, looking something like an English oak (Thompson, List of For. Trees, S. Nig. 1910, p. 6), generally found in poor soils (Col. Rep. l.c. p. 41); very plentiful in some of the districts of the hinterland more especially in the Western Province (Col. Rep. Ann. No. 554, 1908, p. 40); a tree 10–15 ft.

in width, trunk 10 ft. high, Madi, plentiful at 3½° N. lat., leaves smelling heavily of honey and covered in December with the honey bee; flowers creamy yellow, fall off readily and cover the ground (Grant, Trans. Linn. Soc. xxix. p. 105); the most striking tree—handsome, spreading like an oak—from Fatiko to Nimule on the Nile (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 33); common from the Assua River to the Uma River—the boundary between the Bari and Madi countries (l.c. p. 34); a small tree characteristic of the open forests, Ashanti (Thompson, Col. Rep. Misc. No. 66, 1910, p. 90) almost universally distributed in the hinterland, Gold Coast (l.c. p. 73), and common in many parts of the Bahr-el-Ghazal, Sudan (Bull. Imp. Inst. 1911, p. 202).

The cultivation of this tree has not been given much consideration. There is a plantation in the Oloke-Meji Reserve (Govt. Gaz. S. Nig. Oct. 30th, 1907, Suppl. p. 2), and this is important in view of the future development of the trade in the "butter" the demand for which is likely to increase—owing to the present shortage of fats and oils of many descriptions. The demand, however, for some considerable time may be readily met in the supplies being made more accessible by the railway extension in Nigeria. Transport seems hitherto to have been the main drawback but with this provided the large quantities that have evidently gone to waste for many years can now be claimed. Proof of this is advanced in various reports by successive administrators—"Shea trees are abundant [in Borgu] but with a small quantity sold to the Niger Company, the fruit is allowed to rot on the ground" (Lugard, Col. Rep. Ann. No. 476, 1905, p. 75); "Shea in Nupe, Zaria and Nassarawa"—"Most goes to waste for lack of transport or people to gather it" (Wallace, Col. Rep. Ann. No. 551, 1907, p. 75); and "The notable increase in the export of Shea nuts may be expected to continue; the country now being tapped by the Bara Kano railway abounds in the *Butyrospermum Parkii*, and many tons of nuts have hitherto been allowed to rot on the ground for want of transport" (Hesketh Bell, Col. Rep. Ann. No. 674, 1911, p. 11).

More instances might be quoted, but the above will be sufficient to show that conservation is desirable and that full advantage will be taken of the improved conditions favouring the trade in the purely forest product. Meantime to ensure a continuance of the industry it would be advisable to cultivate the tree. It is readily propagated by seed, grows in comparatively poor soil, and thrives in localities where the oil palm (*Elaeis guineensis*) fails to grow. Nigeria possesses in these two trees—the one in the north the other in the south—sources of oil that cannot perhaps be surpassed. Details as to rate of growth are not available but instance may be made of a tree about 14 years old (sent out from Kew in 1899 to Dominica) being reported (1913) as a healthy plant nearly 40 ft. in height, flowering freely but fruiting sparsely (Rep. Agric. Dept. Dominica, 1912–13, p. 3). In the Upper Chari region—where the conditions would correspond approximately to those in N. Nigeria—the tree loses its leaves usually in November and December, the

flowers develop—attracting the bees—in January when at the same time the leaves form at the ends of the branches, and the fruits ripen from the middle of May to the middle of July (Chevalier, Mission Chari Lac Tchad, 1902–04, p. 127).

Ref.—"Note on Shea Butter," Holmes, in Pharm. Journ. [3] ix. 1879, pp. 818–819.——"Beurre de Karité," in Etudes sur les Produits de la Famille des Sapotées, Planchon, pp. 85–91 (Montpellier, 1888).——"Sur L'Arbre Africain que donne le Beurre de Galam, ou de Karité et sur son Produit," Heckel in Revue des Cult. Col. i. 1897, pp. 193–198, pp. 229–233.——"Beurre de Galam ou de Karité," in Recherches sur les Graines Grasses Nouvelles ou peu connues des Colonies Françaises, Heckel, in Ann. L'Inst. Col. Marseille, iv. 1897, pp. 171–182.——"Karité Tree," in Kew Bull. 1899, pp. 53–55.——"*Butyrospermum Parkii*: La Preparation et le Commerce du Beurre de Karité," in Revue des Cult. Col. v. 1899, p. 304.——"Notes Relatives au Beurre de Karité: Étude sur le Beurre de Karité," Vuillet and others in L'Agric. prat. pays chauds, ii. 1902–03, pp. 357–364, Dahomey, Guinée Française, Haut Senegal et Moyen Niger.——"Le Karité et le Chicle," in Les Pl. a Caoutchouc, Jumelle, pp. 518–521 (Paris, 1903).——Le Karité (*Butyrospermum Parkii*): Les Végétaux Utiles de l'Afrique Trop. Franç. fasc. ii. pp. 1–125 (A. Challamel, Paris, 1907).——"Note sur le Karité: Graines et Tourteau," Perrot et Dechambre, in L'Agric. prat. pays chauds, vii. part 1, 1907, pp. 340–344.——"Der Schibutterbaum (*Butyrospermum Parkii*)," in Vegetationsbilder, Karsten and Schenck. iv. 1907, t. 28, 2 pages.——"Shea Nuts and Butter," in Bull. Imp. Inst. vi. 1908, pp. 369–373, with analyses of solid or semi-solid fat from Nigeria and Soudan.——"Le Karité en Afrique occidentale," Yves Henry, in L'Agric. prat. pays chauds, viii. part 1, 1908, pp. 270–281, with map showing "Repartition du Karité au Dahomey."——"Report on Shea Nuts and Butter from Southern Nigeria," Dunstan, in Gov. Gaz. S. Nigeria, Jan. 22nd, 1908, pp. 65–67, with analyses of Shea Butter from Nigeria and the Gold Coast.——"L'Arbre à beurre d'Afrique (*Butyrospermum*) le Karité des Sénégalais," etc., in Mission Chari Lac Tchad, 1902–1904, L'Afrique Central Française. Chevalier, pp. 126–128 (Aug. Challamel, Paris, 1908).——"Le Karité," Ammann, in L'Agric. prat. pays chauds, ix. part 2, 1909, pp. 450–459: "Etude sur le Karité, l.c. x. part 1, 1910, pp. 50–62.——"*Butyrospermum Parkii*," in "Die Nutzpflanzen Togos," Volkens, in Notizbl. Bot. Gart. Berlin, App. xxii. No. 3, 1910, pp. 114–116.——"Shea Nuts": Extracts from Commercial Intelligence Reports.—9th Sept. 1905, 10th Jan. 1907, 27th April 1907, 10th April 1908, James, in Gov. Gaz. S. Nigeria, Feb. 9, 1910, pp. 198–199.——"Le Karité au Dahomey," Noury, in L'Agric. prat. pays chauds, xi. part 2, 1911, pp. 159–165.——"Possible New Market for Shea Butter," in The Lagos Customs and Trade Journal, June 17, 1911, pp. 90–91.——Le Karité et ses Produits, Vuillet, pp. 1–150, 12 pl., 1 map (Emile Larose, Paris, 1911).——"Shea Nuts," in Agric. and Forest Prod. B. W. Africa, Dudgeon,

pp. 124–126 (John Murray, London, 1911).——"Shea Nuts and Shea Butter," in Bull. Imp. Inst. x. 1912, pp. 281–292.——"Northern Nigeria Trade in Shea Products," Mance, in The Lagos Customs and Trade Journ. July 2nd, 1912, pp. 400–403.——"Shea Nuts and Butter," in Col. Rep. Misc. Series, No. 88, 1914, pp. 538–543—S. Nigeria, N. Nigeria, Gold Coast, Sudan, and Uganda.

Mimusops, Linn.

Mimusops bidentata, *A. DC.* in DC. Prod. viii. p. 204.

A tree 60–120 ft. high, 4–5 ft. in diam. (Jenman), sometimes attaining a greater height—150 ft. trunk 94 ft. to the first branch, 12 ft. 3 in. in girth at about 15 ft. from the base (Anderson). Leaves 4–8 in. long, 2–3 in. wide, ovate-oblong, rounded or apiculate at the apex, leathery, upper surface dark green, under surface rusty or bronze, more especially in young leaves. Flowers small, numerous. Fruit about ½ in. in diam. ovoid, edible, similar in taste to that of the "Sapodilla" (*Achras Sapota*).

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, p. 61, f. 12; De Wildeman, Mission E. Laurent, p. 161 (young plant, *M. balata*, at Eala); India Rubber World, March 1st, 1911, pp. 189, 191 (habit-tapping); Harrison, Stockdale & Anderson, Rubber and Balata, B. Guiana, p. 31, ff. 19–22 (tapping), p. 36, f. 23 (*Mimusops globosa* in forest, showing cuts for tapping).

Vernac. names.—Burué (Arrawak and Makusi Indians, *Anderson*); Boerowé (Arrawak Indians, *Bleekrode*); Bolletree (Dutch Guiana, *Bleekrode*); [Koberu or Koobi-arri (Warrau), Parata-Eboo (Carib), Irriarri (Wapisiana and Atorai) *Anderson*]; Burueh (B. Guiana, *McTurk*).—Bullet or Bully Tree, Balata.

Native of Venezuela and the Guianas.

Yields the "Balata" of commerce, a product which in some respects (elasticity, etc.) resembles rubber and in others (ductility, etc.) gutta-percha; with gutta-percha (*Palaquium Gutta*) it may, after allowing for local conditions, also be placed for culture, tapping—usually carried on in the wet season—and general trade purposes. The latex of "Touckpong" Rubber (*Sapium Jenmani*) has at times been used to mix with that of Balata. The best quality now produced in B. Guiana contains moisture 1·9; Gutta 49·7; Resin 44·0; Impurities 4·4 (Harrison & Bancroft). Balata is suitable for machinery belting rather than insulating purposes.

Balata sheet was quoted at 3s. 1d. and block at 2s. 2d. per lb. on the London market (India Rubber World, Aug. 23rd, 1913, p. 27), and the imports appear to be entered as Gutta Percha (p. 406), especially the figures for the Guianas, Venezuela, etc.

It is the chief forest product of British Guiana, from whence the export amounted in 1904–05 to 493,067 lb., value 176,844 dollars, and in 1905–6 to 517,335 lb., value 181,848 dollars (Board of Trade Journ. Sept. 13, 1906, p. 523, from Rep. Inst. Mines and Forests, Br. Guiana, June 30th). Balata to the amount of 377,203 lb. in 1912 and 829,157 lb. in 1913 was shipped from British Guiana (West India Comm. Circ. Nov. 18th, 1913, p. 551).

Experiments have been made in the extraction of balata from the leaves by Jungfleish (Paris), Wijsman (Leyden) and Greshoff (Haarlem), 4 per cent., 5 per cent. and 1·7 per cent. being attained respectively. Greshoff concluded that it would not pay to extract balata from the leaves in Europe on account of freight, nor in S. America owing to expense of the necessary chemicals (Pharm. Journ. [4] xvii. 1903, p. 383).

The fresh milk is described as drinkable, the Negroes of Guiana being accustomed to mix it with their chocolate (Cons. Rep. Misc. No. 406, 1896, p. 2), though they knew the injurious effects of taking spirits after drinking this milk (l.c.).

Jenman (Govt. Rep. Balata, 1885, p. 12) gives the wood as one of the hardest and densest in the colony, weight 80 lb. per cubic foot. Stone (Timb. of Comm. p. 148) gives $63\frac{1}{2}$–$67\frac{1}{2}$ lb. as the recorded dry weight of "Bullet Wood"; 70 lb. per cubic ft. (W. Indian Bull. xiii. 1913, p. 274); while a specimen in the Kew Museum has a specific gravity of 1·11 = 69 lb. per cubic ft. These weights all agree in showing that the timber cannot be floated, and accordingly much has been wasted by the habit of cutting the trees down to tap them for Balata, and thus accounting for the comparatively small export—none in 1896 (Jenman, l.c.), only to a slight extent in 1898 (Morris, Kew Bull. Add. Series i. p. 34); though at the present time the felling is prohibited except by special permission, which also may reduce the trade supply of the timber. The wood is valued locally for mill rollers, railway sleepers, windmill arms, shafts and framework, and rice pestles (Jenman); much used by wheelwrights; suitable for bridges, posts and all kinds of outdoor work (W. Indian Bull. l.c.). Value £10 per ton (l.c.), similar to those of "Greenheart" (*Nectandra Rodioei*) on land, but not so suitable for use under water; the bleeding for balata is said to affect the colour and texture of the wood until the tree recuperates (West India Comm. Circ. xxix. 1914, p. 128). Balata has been little cultivated owing to the slowness of its growth (Cons. Rep. Misc. l.c. p. 7). Recorded in list of plants at Old Calabar (Don, 1907) sent out from Kew 1900. The tree grows singly or in small groups, preferring ridges or sloping ground and is not particular as to soil (W. Indian Bull. l.c.). Tapping is only permitted on trees 36 in. in circumference at 4 feet from the ground and upwards; in British Guiana, where the trees average from 1 gallon (= 5 lb. of dry balata) to 5 gallons (= 25 lb. balata) each (Harrison, Stockdale & Anderson, Rubber and Balata, B. Guiana (1911) pp. 33–34), another estimate is from 12–20 lb. of balata from the largest trees and 4 or 5 lb. from a young tree a foot in diameter (Morris, Kew Bull. Add. Ser. i. p. 34).

Ref.—"Notice sur la Gutta-Percha de Surinam," Bleekrode, in Ann. Sci. Nat. 4th Series, vii. 1857, pp. 220–228.——"Gutta Percha of Surinam," Bleekrode, in Journ. Soc. Arts, v. 1857, pp. 625–627.——"Balata," in Spon's Encycl. Industr. Arts, Div. V. pp. 1635–1636 (E. and F. N. Spon, London, 1882).——Balata and the Balata Industry: Forest Laws, etc. Jenman, Government Report, pp. 11–38 (Royal Gazette Office, Demerara,

1885).——"Balata," in Étude sur les Produits de la Famille des Sapotées, Planchon, pp. 54–59 (Montpellier, 1888).——"Balata: *Sapota Mulleri*," in Med. Pflan. Köehler, iii. 2 pages.——Report on the Balata Industry of Dutch Guiana, Dip. and Cons. Rep. Misc. No. 406, 1896, pp. 1–8.——"Balata," Obach in Journ. Soc. Arts, xlvi. 1897, pp. 158–164.——"Le Balata," in Revue des Cultures Coloniales, vii. 1900, pp. 692–694.——"Balata and Its Employment," in India Rubber Journ. Oct. 27th, 1902, pp. 418–419.——"La Balata," in Les Pl. à Caoutch. dans tous les pays chauds, Jumelle, iv. pp. 493–517: Historique, Caractères, Propriétés et Usages du Produit, Exploitation des balatas dans les Guyanes, Commerce (A. Challamel, Paris, 1903).——"Bullet Wood, *Mimusops globosa*," in Timbers of Commerce, Stone, pp. 148–149 (William Rider and Son, Ltd. London, 1904).—— De Balata-industrie in Suriname, Fock, in 3 parts, pp. x. + 66 + cix. + 67 + 98 (Paramaribo, 1909); Part 1, various Govt. Reports, covering the history of the Balata in Surinam; Part 2, distribution, tapping, coagulation and general account of the Industry; Part 3, Chemistry, falsification and Uses of Balata [not seen, particulars from Exp. St. Rec. 1909, p. 443].——"Balata from British Guiana," in Bull. Imp. Inst. vii. 1909, p. 7–8, *Mimusops Balata*, with analysis.——"Balata Trade," in India Rubber Journ. Feb. 18th, 1911, pp. 17–18, and "India Rubber in Dutch Guiana," in India Rubber World, March 1st, 1911, pp. 189–191. ——"Balata and Rubber in B. Guiana," in India Rubber Journ. April 8th, 1911, pp. 37–38.——Rubber and Balata in B. Guiana, Harrison and Stockdale, pp. 1–46, 2 maps (Anderson) and 24 illustrations (Dept. of Science and Agric. B. Guiana, 1911).—— "Balata and Rubber Industries," Leaflet No. 3, British Guiana, Jan. 1911, pp. 1–8; prepared by the Secretary for the Permanent Exhibitions Committee.——De Balata-Industrie in Suriname, Suppl. Door Fred. Oudschans Dentz, pp. 1–14 and pp. i.–xxvi. (Paramaribo, 1911).——"Balata: *Mimusops bidentata* DC. (*M. Balata*, var. *Schomburgkii*, Pierre; *Sapota Mulleri*, Bleckrode)," Hillier, in Kew Bull. 1911, pp. 198–202. ——"Balata Resources of British Guiana," in India Rubber Journ. Nov. 16th, 1912, pp. 26–27; Forestry Rep. Anderson, giving Distribution and Soil. ——"Species of Mimusops of the Balata Group found in British Guiana," Anderson, in Journ. Bd. of Agric. B. Guiana, v. April, 1912, pp. 251–253.——"The Balata (Rubber) Industry of British Guiana," in Journ. Roy. Soc. Arts, lxi. 1913, pp. 318–319.—— "Rubber and Balata in British Guiana," in The India Rubber World, Sept. 1st, 1913, p. 649.——"Bullet Tree (Mimusops balata)" (in "The Timbers of British Guiana"), The West India Comm. Circular, xxix. 1914, p. 128.——"Balata and Wild Rubber in British Guiana," Harrison & Bancroft, in Rubber Recueil Inter. Rubber Congrés Met. Tentoonstelling, Batavia, 1914, pp. 53–55 (J. H. De Bussy, Amsterdam).

Mimusops Djave, *Engler* in Eng. & Prantl, Pflanzenf. Nachtr. i. p. 279.

A tree with a symmetrical straight trunk, 4–7 ft. in diam. 35–45 ft. high, branching like an oak. Flowering branchlets stout, with clusters of leaves and flowers at the tips. Leaves elongate-obovate or ob-lanceolate, rounded and very shortly and obtusely acuminate, narrowing towards the base, about 1 ft. long, 4–5 in. wide, entire, chartaceous, dark brown above, light brown below, glabrous, midrib prominent below, slightly impressed above, lateral nerves 30–35 pairs, at an angle of about 70°, looped near the margin, prominent below; petiole $1\frac{1}{2}$–2 in. long, moderately stout. Flowers pedicellate about $\frac{1}{2}$ in. in diam. Pedicels about $1\frac{1}{2}$ in. long, rather stout, pubescent. Fruit more or less globose, crinkled when dry, 3 in. in diam., dark purple, several seeded. Seeds somewhat ellipsoid, 2 in. long, $1\frac{1}{2}$ in. broad, with a rough bony hilum covering nearly one-half the seed, remainder of the testa bony, smooth, rich brown; kernels oily.

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, tt. 32, 33, f. A.; Chevalier, Les Vég. Util. L'Afriq. Trop. Franç. Fasc. ii. ff. 25, 26, 27 (fruits); Tropenpfl. 1910 p. 30 (habit), p. 33 (seedling plants); Thompson, Col. Rep. Misc. No. 66, 1910, t. 20; Tropenpfl. Beihefte, xii. 1911, t. 6 (Njabibaum) t. 8 (habit); Bolton and Revis, Fatty Foods, p. 190, f. 15 (seed).

Vernac. names.—Aganokwi (Benin, *Thompson*); Oureri (F.W. Africa, *Perrot*); Noumgou (Cameroon, *Perrot*); Numgu (Cameroon, *Engler*); N'Jave or D'Jave (Gaboon, *Perrot, Engler*); Njabi (Cameroon, *Jentsch*); Adjab or N'Jabi (Cameroon, *Fickendey*); Ajali-d'Jave, Ayali-noungou (Gaboon, *Lanessan*).—Cameroon mahogany (*Fickendey*).

Degema, New Calabar River, S. Nigeria (Sherriff, July 1906, Herb. Kew). Known also from the Gaboon and the Cameroons.

The fruit according to Fickendey (Tropenpfl. 1910, No. 1, p. 29) tastes mealy, slightly acid and is refreshing. When unripe it contains latex.

The kernels yield by expression 60 per cent. and upwards of an oil or fat, somewhat similar to that of "Shea Butter" (*Butyrospermum Parkii*) and "Mowrah" or "Mhowra," (*Bassia latifolia*), edible when extracted from the fresh seeds, but the residue like that of the Bassia is poisonous and fit only for manure or it might be used in the preparation of a dressing for lawns to destroy worms. It is in this respect not unlike *Trichilia emetica*, *q.v.* p. 146. Adjab seeds are said to be used in the well known poison ordeal of the Bakokos, Jaundes and Ngumbas, death ensuing in the course of a few hours after eating (Fickendey). The residue after the extraction of the oil is used for stupefying fish (l.c.). The poisonous principle is saponin, and Fickendey mentions that the residue can be rendered harmless by treatment with hot water. Mr. Norman Tate reporting on a sample of seeds (now in the Kew Museum) from the Niger in 1884 stated that the oil or butter possessed all the characteristics of ordinary Shea Butter, but the residue was not suitable for food cake.

The constants of Adjab fat are given in Tropenpflanzer, xiv. 1910, p. 32 in comparison with those of Shea Butter to which the figures

bear a striking similarity especially in the saponification and iodine numbers, though the melting point (56° C) and the solidification point (53·8° C) in the constants of the fatty acids quoted for Shea Butter are higher by an average of 7° in the first instance and 8° in the latter. A sample of seeds from S. Nigeria (1906) examined at the Imperial Institute showed that the constants of the fat closely resemble those of Shea Butter, and it was calculated that the kernels would probably be of about the same value (Bull. Imp. Inst. 1908, p. 374).

The fat has been recommended for the manufacture of soap and candles.

The seeds have been exported from the Cameroons for several years chiefly to England. In 1906, the export was 3233 kilog. value 226 marks; 1907, 14,890 kilog. value 1388 marks, and in 1908, 183,697 kilog. value 20,610 marks (Tropenpfl. l.c. p. 35).

The seeds of this species and those of *Dumoria Heckelii* (*q.v.* p. 422) are so much alike that it is impossible to distinguish them and either of them may have been sent to Kew from Liverpool at various times during the last 30 years under the names of "Ngarve Nuts," "Mahogany Nuts," etc.; they have also been submitted as "Shea Butter Nuts."

The tree yields a thick white milk which very easily solidifies, a deep incision being necessary in old stems or branches to cause an abundant flow of milk (Sherriff, Mus. Kew). The extract believed to be from this species has been found on examination to be of a resinous character and of no commercial value (Col. Rep. Ann. No. 583, 1908, p. 36).

Yields an excellent and valued timber, Cameroons (Fickendey). One of the finest timber trees in W. Africa, sold in Europe as "African Pear Wood," at 6d. per foot, often figured (Thompson, List of For. Trees, S. Nig. 1910, p. 6, *Mimusops sp.* nr. *Djave*); seen in an area situated on the right bank of the Kwa River above Calabar [some 5 sq. miles in extent, visited with a view to acquiring it as a Reserve and for a Rubber Plantation] (Thompson, Ann. Rep. Forestry Dept. 1911, S. Nigeria, p. 3).

Farquhar reports (Govt. Gaz. S. Nigeria, 1911, No. 22, Suppl.) plants of this species are being raised at the Victoria Gardens, Cameroon—the kernels fetch a fair price but they are available only for a few months in each year. The country where Sherriff collected his specimens is described by him as flat and the soil coarse sand (Mus. Kew). In the Cameroons, the tree is widely distributed in the zone of primeval forest: it thrives on laterite and alluvial soils but appears to avoid those of volcanic origin, and does not occur on the Cameroon or the Bakossi mountains, flowering February to March; fruiting July to August (Fickendey).

Ref.—"D'Jave ou Noumgou: *Mimusops D'jave*," Perrot, Les Vég. Util. de L'Afriq. Trop. Franç. Fasc. ii. pp. 160–171 (A. Challamel, Paris, 1907).——"Seeds of *Mimusops* sp." in Bull. Imp. Inst. vi. 1908, pp. 373–374, with analysis.——"*Mimusops*

D'jave, in Notizblatt, Bot. Gart. Berlin, No. 45, Nov. 18th, 1909, pp. 118–120.——"Untersuchung des Fettes von *Mimusops D'Jave*," Kranze, in Der Tropenpflanzer, xiii. 1909, p. 283.——"Der Samen von *Mimusops Djave*, Fickendey, in Der Tropenpflanzer, xiv. 1910, pp. 29–36.——"Seeds of *Mimusops* sp." in Col. Rep. Misc. Series, No. 88, 1914, p. 543, with analysis.——"*Baillonella toxisperma*, Pierre, ou *Mimusops Djave*, Engler," (in Matières grasses), De Wildeman, in Bull. de L'Association des Planteurs de Caoutchouc, vi. May 1914, p. 82; from "Étude pharmacologique des graines du *Dumoria Heckeli* et du *Baillonella toxisperma*, Fournier" (Clermont-Ferrand, 1913).——"Djave Butter," in Fatty Foods, Bolton and Revis, pp. 190–191, with analysis (J. & A. Churchill, London, 1913).

Mimusops Elengi, *Linn.*; Sp. Pl. (1753) p. 349.

A large evergreen tree up to 50 ft. in height. Leaves glabrous, shining elliptic, acuminate, 3–4 in. long, 1–1½ in. broad. Flowers white, fragrant, about an inch across the corolla lobes. Fruit yellow, ovoid, about 1 in. long, 1 seeded.

Ill.—Rheede, Hort. Mal. i. t. 20; Rumpf, Amb. ii. t. 63; Gaertner, Fruct. Sem. Pl. i. t. 42; Lam. Encycl. t. 300; Roxb. Pl. Corom. t. 14; Blanco, Fl. Filip. t. 105; Wight, Ic. Pl. Ind. Or. iv. t. 1586; Bedd. Fl. Sylv. t. 40; Engler and Prantl, Pflan. iv. pt. 1, f. 82 E.–J.; Talbot, For. Fl. Bombay, ii. p. 162, f. 375.

Vernac. names.——Tanjong (Perak, *Long*); Maulsiri (Hindustan, *Hooper*); Mogadam (Tamil, *Hooper*); Papagan (Philippines, Mus. Kew); Bukul (Calcutta, Mus. Kew).

Native of India, Ceylon, Burma and the Malay Peninsula. Cultivated in various parts of the Tropics.

The kernels yield an oil used in India for cooking, burning, and medicinal purposes. According to Hooper they yield on extraction with ether 18·47 per cent. of oil—yellowish-brown, viscid, and by expression the oil is yellowish-white, with stearine depositing on standing (Agric. Ledger, No. 5, 1911–12, p. 153, *q.v.* for analysis). Various medicinal uses are attributed to the bark, fruit, flowers and seed in India (Dict. Econ. Prod. India). The bark is used in Bengal for dyeing shades of brown, it contains according to Prof. Hummel (Leeds) 4 per cent. of tannic acid, but in comparison with Divi-divi, Valonia, Myrabolans, and Sumach, of little commercial value.

The wood is used for housebuilding, carts and cabinet work (Arcot, India, Mus. Kew), and for rice pounders; weight 54–62 lb. per cubic ft. (Gamble, Man. Ind. Timb. p. 450).

Propagated by seeds. A nursery was started in the Oloke-Meji Reserve in 1908 (Col. Rep. Ann. No. 630, 1909, p. 14) and in 1910, 4000 seedlings were planted out in this Reserve (l.c. No. 695, 1911, p. 11). The tree is cultivated in India chiefly for its ornamental appearance and its fragrant flowers (Dict. Econ. Prod. India); one of the best woods in the dry Carnatic evergreen forests (Gamble, *seq.* p. 450).

Ref.—"*Mimusops Elengi*," in Dict. Econ. Prod. India, v. part 1, 1891, pp. 249–251.——"*Mimusops Elengi*," in Manual of Indian Timbers, Gamble, pp. 449–450.

Mimusops lacera, *Baker*, Fl. Trop. Afr. III. p. 507.

Ill.—*Engler*, Monogr. Afr. Puan. *Sapotaceae*, t. 20 B.

Vernac. names.—Emido (W. Prov. S. Nigeria, *Thompson*); Aganokwi (Benin, *Thompson*); Bonding aling (Batanga, *Bates*); Ntaguaya, Isonguin (Ivory Coast, *Courtet, Chevalier*); Anainguéri, Bempé (Ivory Coast, *Courtet*).

Nun River [Niger]; Central Province; in the Western Province, S. Nigeria; Nupe in N. Nigeria, and found also on the Ivory Coast, Togoland, extending to Batanga in S. W. Africa.

A very good timber (Col. Rep. Ann. No. 512, 1906, p. 23); suitable for bulkheads, River Nun (Mann, Mus. Kew); similar to *D'Jave*, but of closer grain (Thompson, List of For. Trees, S. Nig. 1910, p. 6); said by the natives of Batanga to be used for house posts (Bates, Herb. Kew); wood blood red, very strong; used for rolling stock and railways, Ivory Coast (Courtet, Bois, Cote d'Ivoire, in L'Agric. prat. pays chauds, x. 1, 1910, p. 456). Density given by Chevalier (Les Vég. Util. L'Afriq. Trop. Franc. Fasc. v. 1909, p. 243) and Courtet (l.c.) as 1·045 [= 65 lb. per cubic ft.].

The tree yields a substance like Gutta Percha (Barter, Herb. Kew; Moloney, For. W. Afr. p. 378; Fl. Trop. Afr. l.c.)

Propagated by seed. Found in the evergreen forests, Central Province, S. Nigeria (Col. Rep. Ann. No. 512, 1906, p. 23), as a tree 40–50 ft. high, Nun River (Mann, Herb. Kew), tree abundant, trunk 7 ft. in circumference, River Nun [Niger] (Mann, Mus. Kew); 25–30 metres high, with trunk 60–70 cm. in diam. Ivory Coast (Courtet, l.c.), a middle sized tree with low scraggy branches, Batanga (Bates, Herb. Kew). This is one of the trees prohibited from being cut on native lands without a licence (see Forestry Ordinance, Order No. 26, 1912, Govt. Gaz. S. Nigeria, Sept. 4th, 1912, p. 2242, and Schedule p. 2244).

Mimusops multinervis, *Baker*, Fl. Trop. Afr. III. p. 506.

Ill.—Engler, Monogr. Afr. Pflan. *Sapotaceae*, t. 20, f. A.

Vernac. names.—Emido (Lagos, *Foster, McLeod, Hislop*); Emido (Yoruba, *Thompson*); Aganokwi (Yoruba, *Thompson*).—Bakum Mahogany.

Lagos; Nupe, Central Province, S. Nigeria.

Wood hard, reddish in colour, often figured, exported from the Niger as African Mahogany (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89); rich coloured, hard, resembling mahogany (Kew Bull. 1908, p. 191; Col. Rep. Misc. No. 51, 1908, p. 12); used for making mortars and bowls; the branches used for house posts (Thompson, List of For. Trees, S. Nig. 1910, p. 6).

The bark yields a latex which coagulates to a hard and brittle substance, found to contain 66 per cent. of resin and 29 per cent. of a somewhat friable gutta-like material, not likely to be of any commercial value (Col. Rep. Ann. No. 695, 1911, p. 39).

Found as a tree, 40 ft., Nupe (Barter, Herb. Kew), attaining a height of 120 ft. and 40 ft. in girth, Benin City district (Kew Bull. 1908, p. 191), very plentiful in some of the moist evergreen forests, having a tendency to grow gregariously (Col. Rep. Misc. No. 51, l.c.), throughout the Central Province, S. Nigeria (Kew Bull. l.c.), confined to the vicinity of streams, not common on the Afram Plains, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89). One of the trees prohibited from being cut on native lands without a licence (see ref. under *M. lacera*).

May be propagated by seed. 1670 seedlings are reported to have been put out in the Oloke-Meji Reserve in 1908 (Col. Rep. Ann. No. 630, 1909, p. 14).

Dumoria, A. Chev.

Dumoria Heckeli, *A. Chev.* in Compt. Rend. Acad. Sci. Paris, cxlv. (1907) p. 267.

A tree, 100–150 ft. high, trunk cylindrical at the base, 3–6 ft. in diam., branching about 90 ft. from the ground. Leaves crowded towards the ends of the branches, oblong-lanceolate or obovate, sometimes shortly and obtusely acuminate, 2½–5 in. long, 1¼–2 in. broad, chartaceous, glabrous, shining on the upper surface, dark brown above, light brown below, lateral nerves numerous, spreading, faint; petiole ¾–1¼ in. long, slender. Flowers axillary, 2 or 3 together, pedicellate, pedicels ¾–1 in. long, slender, glabrous. Sepals 4, ovate, sub-acute, 1½ lin. long, about 1 lin. broad, finely puberulous outside. Corolla greenish-white, about ⅓ in. in diam., fragrant. Fruit 1–3-seeded, globose, about 3–5 in. in diam.; pulp soft, not edible, yellowish-apricot in colour. Seeds very similar to those of *Mimusops Djave*.

Vernac. names.—[Dumori (Agni), Mako, Makoré, Makerou (Apollonien), Mbaba or Mbabu (Attie), Butusa (Néonolé, Kroo), Garesu (Bété), Ivory Coast, F.W. Africa, *Chevalier*, *Courtet*], Baku, Baco or Abaku (N. Ashanti, Gold Coast, Imp. Inst. Nos. 40125, 38765, 1911, Herb. Kew; Mus. Kew); Bahu (Abé, Ivory Coast, *Courtet*).—One of the so-called African Mahoganies.

All the specimens at Kew Herbarium are from the Ivory or Gold Coast (Chevalier, No. 16253, 1911, and Agric. Dept. Aburi, 1911). Chevalier (l.c.) also mentions Liberia. Not recorded from Nigeria, but as the seeds are indistinguishable from those of *Mimusops Djave*, under which name several of the *Dumoria* specimens have been sent to Kew a description has been added.

The wood is of a fine red colour, handsome grain and one of the best substitutes for African mahogany (*Khaya*). It is imported into Liverpool from the Gold Coast—neighbourhood of the French West African frontier, chiefly by way of Axim (Chevalier, Compt. Rendu, Acad. Sci. Paris, cxlv. 1907, p. 269). Used for cabinet work (Courtet, Bois, Cote d'Ivoire, in L'Agric. prat. pays chauds, x. part 1, 1910, p. 458); recommended for automobiles and railway carriages (Chevalier, Les Vég. Util. de L'Afriq. Trop. Franç. v. 1909, p. 238); density 0·716 (Courtet, l.c.), almost equal to 1

(Chevalier, Compt. Rendu, l.c.). Specimens of wood at Kew named "Baco" (Leopold de Rothschild, 1899) and "Abeku" (G. E. Ferguson, 1891) have a specific gravity of 0·717 and 0·643 = to 45 lb. and 40 lb. per cubic ft. respectively; they are both from the Gold Coast.

Hébert states that the seeds yield "Doumori butter," used by the natives of French West Africa as food, and his analysis is given as follows:—Yield of husked seed, 40 per cent.; density at + 15° C., 0·956; melting point + 34° C.; acidity index, 5·6; saponification index, 188; iodine value, 56·4; melting point of fatty acids —oleic, carnaubic or cerotic, stearic and palmitic + 60°C. (Inter. Inst. Agric. Rome, Bull. Bur. Agric. Intell. Aug.-Sept.-Oct. 1911, p. 2075 from La Quinzaine Col. Paris, xv. Août, 1911, p. 541). The fat is reported as of about the same value for soap-making as middling quality palm-oil; the residue after extraction of the oil owing to its intensely bitter taste, is not suitable for feeding purposes; the dried kernels in good condition were valued (1910) at £13 per ton in England (Col. Rep. *seq.* p. 544). The yield of one tree is given as up to 4000 fruits giving about 66 lb. of solid fat (Bull. Imp. Inst. 1911, p. 159 from Hébert, Les Matières Grasses, iv. 1911, p. 2158).

The method of extraction of the oil from the "Bacco" Nut on the Gold Coast is said to be the same as for palm-kernels (*Elaeis guineensis*), i.e., "beating the kernels in a wooden mortar and then frying in a pot" (Ferguson, Mus. Kew).

Bako mahogany is probably this species (Kew Bull. 1894, p. 9).

Ref.—"Sur un nouveau genre de Sapotaceae (*Dumoria*) de l'Afrique occidentale, a graines fournissant une matière grasse comestible," Chevalier, in Comptes Rendus Acad. Sci. Paris, cxlv. 1907, pp. 267–269.——"*Dumoria Heckeli*, A. Chev." in Les. Vég. Util. de L'Afrique Trop. Franç. v. 1909 Bois de la Cote D'Ivoire, pp. 237–241.——"Baco or Abaku Nuts (*Dumoria Heckeli*)," in Col. Rep. Misc. Series No. 88, 1914, pp. 543-544, with analysis.——"*Dumoria Heckeli*," De Wildeman, in Bull. L'Assoc. Pl. Caoutchouc, vi. May 1914, "Matières grasses," p. 82.—See also refs. under *Mimusops D'jave*.

EBENACEAE.

Maba, Forst.

Maba Mannii, *Hiern*; Fl. Trop. Afr. III. p. 516.

Nupe, Banks of the Guarara River, N. Nigeria, Bagroo River; Sierra Leone, etc.

A small tree or arborescent shrub. Flowers white; ripe fruits bright orange colour, Nupe (Barter, No. 1220, Herb. Kew).

Diospyros, Dalech.

Diospyros atropurpurea, *Guerke* in Engl. Bot. Jahrb. xxvi. (1904), p. 67.

A medium sized tree; branchlets slender, glabrous. Leaves oblong or oblong-elliptic, rarely lanceolate-oblong, obtusely

acuminate, obtuse or slightly cuneate at the base, $4\frac{1}{2}$–7 in. long, $1\frac{1}{2}$–$2\frac{1}{2}$ in. broad, entire, thinly chartaceous, shining above, duller below, glabrous, lateral nerves 3–6 on each side, ascending, prominent below. Cymes 1–3 flowered. Calyx lobes of the female, large and coriaceous, ovate-deltoid, shortly yellowish puberulous outside. Fruits reticulate, 4-celled, ovoid, sub-acute, about $\frac{3}{4}$ in. in diam., surrounded by the persistent calyx lobes.

Ill.—Engler, Bot. Jahrb. xliii. 1909, p. 212, f. 4.

Vernac. names.—Igedudu (W. Prov. S. Nigeria, *Thompson*). Igedudu (Benin, *Dennett*).

Benin (Thompson, No. 4, 1906, Herb. Kew; Dennett, No. 27, 1907, Herb. Kew).

Wood described as a brown ebony (Thompson, List of For. Trees, S. Nig. 1910, p. 3). A sample was valued in 1905 as ebony at £5 to £10 per ton (Kew Bull. 1908, p. 194).

One of the trees prohibited from being cut on native lands without a licence (Forestry Ordinance, Order No. 26 of 1912, Govt. Gaz. S. Nigeria, Sept. 4th, 1912, p. 2242, and Schedule, p. 2244); found all over the Central Province, especially near the Niger (Kew Bull. l.c.).

Diospyros crassiflora, *Hiern*; Fl. Trop. Afr. III. p. 525.

Vernac. names.—Kanran (Yoruba, *Thompson*); Aborpor or Aborkpor (Benin, *Thompson, Foster*).

Old Calabar (Thomson, No. 47, Herb. Kew); Benin (Foster, No. 196, 1908, Herb. Kew).

Wood described as a black ebony (Thompson, List of For. Trees, S. Nig. 1910, p. 2).

Found as a tree about 40 ft. Benin (Foster, l.c.).

Diospyros Dendo, *Welw.*; Fl. Trop. Afr. III. p. 523.

Ill.—Hiern, Monogr. Ebenac. t. 10; Stone, Timb. Comm. t. 10, f. 85 (trans. section of wood).

Vernac. name.—Dendo or N'Dendo (Angola, *Welwitsch*).—Black Ebony, Billet Wood, Gaboon, Lagos, or Calabar, Ebony.

Angola (Welwitsch): Kamerun (Zenker, No. 2633, 1903, Herb. Kew). There is no specimen from Nigeria at Kew, but Thompson states (List of For. Trees, S. Nigeria, 1910, p. 2) that it is the chief ebony of the Eastern Province. It is one of the trees prohibited from being cut on Native lands, S. Nigeria, without a licence (Forestry Ordinance, Order No. 26 of 1912, Govt. Gaz. S. Nig. Sept. 4, 1912, p. 2244).

Wood used for building purposes, Angola, where it is one of the strongest, densest and most durable in the forests, white in the outer part with black bars in the middle of the trunk (Hiern, Cat. Welw. Afr. Pl. iii. p. 653); or very black and hard in the centre (*Idem*, Monogr. Ebenac. p. 196); heartwood black or black with brown streaks well defined from the brownish-white sapwood, weight $72\frac{1}{2}$ lb. per cubic ft.; used for turnery, inlaying, etc. (Stone, Timb. Comm. p. 153).

Found as an evergreen tree 25–40 ft. high, 1–2 ft. in diam., plentiful in the primitive, dense and most elevated forests, Golungo Alto (Hiern, l.c.); flowers from December to February; fruits in March (Hiern, Monogr. Ebenac, p. 197).

See particulars of Ebony in general at end of order.

Ref.—"Black Ebony, *Diospyros Dendo*," in Timbers of Commerce, Stone, pp. 153–154.

Diospyros mespiliformis, *Hochst.*; Fl. Trop. Afr. III. p. 518.

Ill.—Warburg, Kumene Exped. p. 329; Engler, Bot. Jahrb. xliii. 1909, p. 201, f. 4; Notizbl. Bot. Gart. Berlin, App. xxii. 1909, p. 30; Engl. and Drude, Veg. Erde, ix. p. 78, f. 63; Agric. Col. Italy, v. 1911, Suppl. p. 70.

Vernac. names.—Kainya (Gorgoram, N. Nigeria, *Elliott*); Kainya (Katagum, *Dalziel*); Kanran (Yoruba, *Thompson*); Abo Kanran (Lagos, *Foster*); Guran (Arabic [Kordofan] *Muriel*); Silveira or Musolveira, Mulende (Golungo Alto, *Welwitsch*); Bissess (Yemen, *Barby*); [Aje or Ajejeh (Abyssinia), Kasinjamtolmera (Tette), Makudima (Sechuana), *Hiern*, *Moloney*]; Dabakala, Sounson (F. W. Africa, *Pobéguin*); Jieghan, Shuma (Sudan, Bull. Imp. Inst. 1911, p. 209).—Monkey Guava; Ebony, Zanzibar Ebony.

Lagos (Foster, No. 35, 1906, Herb. Kew); Nupe (Barter, Nos. 1208, 1334, Herb. Kew); Katagum (Dalziel, No. 219, 1908, Herb. Kew); Gorgoram (Elliott, No. 162, 1904) and Guarara River, N. Nigeria (Elliott, No. 215, 1905, Herb. Kew).

Found also between Tette and the Sea Coast (Kirk), Yemen (Barby), Kordofan and Blue Nile (Muriel), Nile-Bari Country (Dawe), Angola (Welwitsch), and in general throughout Tropical Africa from Senegambia to Mozambique, and Zanzibar.

Fruit edible. Heartwood black, and comes into the market in billets as Ebony. According to Welwitsch (Hiern. Cat. Welw. Afr. Pl. iii. p. 651) the wood is very hard, heavy, white, well adapted for making screws; Thompson (List of For. Trees, S. Nigeria, 1910, p. 3), used for making combs, walking sticks, rulers and furniture; *Idem* (Col. Rep. Misc. No. 66, 1910, p. 89), heartwood black and furnishes one of the ebonies of commerce; Kirk (Herb. Kew) wood black, like ebony dark only in the heart, and to Dalziel (Herb. Kew) the common ebony of the [Katagum] country. Chevalier (Bull. Soc. Nat. d'Accl. de France, 1912, p. 133) states that the wood turns black only after the death of the tree.

Old Calabar Ebony, believed to be *D. mespiliformis*, was being shipped in 1889 to the extent of 600 to 800 tons a year(Saunders, Mus. Kew). A sample of "Kanran" Ebony was exhibited at the Agricultural Show, Ibadan, 1910, by the Agric. Dept. Oloke-Meji (Govt. Gaz. S. Nigeria, 6th April, 1910, p. 484).

The leaves, fruits, and roots are used for various medicinal purposes in French W. Africa (Pobéguin, Pl. Med. du Guin., Franç. in L'Agric. prat. pays chauds, xi. part 1, 1911, p. 487).

Found as a shrub 10 ft. or tree 40 ft. high, Nupe (Barter, Nos. 1208, 1334, Herb. Kew); a large tree on the banks of Komadugu Waube and on banks of many of the rivers, N. Nigeria (Elliott, No. 162, Herb. Kew); a small tree in the Bari country, Nile region (Dawe, No. 891, Herb. Kew); in forests, especially in those less dense and sandy throughout Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iii. p. 651); a tree of large size in the mixed evergreen and deciduous forests, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 89), plentiful in the mixed forests in the drainage areas of the Calabar and Cross Rivers, S. Nigeria (l.c. No. 51, 1908, p. 27) and as a conspicuous tree common in the eastern middle Veld of the Zoutpansberg (Burtt Davy, Kew Bull. 1908, p. 152).

May be propagated by seed. In the Oloke-Meji Forest Reserve, S. Nigeria, there were 2370 seedlings put out in 1908 (Col. Rep. Ann. No. 630, 1909, p. 14) and the tree is being cultivated in combination with Teak (*Tectona grandis*) in Togoland (Unwin, Rep. Affor. Togoland, 1912, p. 30).

See references at end of order.

Diospyros mombuttensis, *Guerke* in Engl. Jahrb. xxvi. (1904) p. 66.

A tree or shrub 10 ft. high (Barter) with glabrous branches. Leaves shortly petiolate, obovate-lanceolate, shortly acuminate, narrowed at the base, up to 6½ in. long and 3 in. broad, entire, subcoriaceous, sparingly puberulous on the nerves on both surfaces, otherwise glabrous. Cymes 3–5 flowered, shortly pedunculate. Flowers sessile, greenish-yellow, fragrant (Barter). Calyx tubular, 5 lin. long, silky pubescent outside, bidentate, the teeth sometimes 2-3-denticulate. Corolla 4-lobed, twice the length of the calyx; lobes ovate, acute, with hairy tips. Stamens 16.

The tree has on various occasions been confounded with *D. senensis*, Klotsch, Fl. Trop. Afr. iii. p. 520, a distinct plant, commoner on the East Coast.

Vernac. name. — Ogan pupa (Oloke-Meji, *Foster*, Ibadan, *Punch*, Yoruba, *Thompson*).

Lagos (Foster, No. 59, 1906; Rowland, 1893, Herb. Kew); Abeokuta (Irving, No. 141; Barter, No. 3390, Herb. Kew); Eppah and Aboh (Barter, Nos. 3250, 290, Herb. Kew); Apomu, S. Nigeria (Foster, No. 210, Herb. Kew); Ibadan Forest Reserve (Punch, No. 30, 1901, Herb. Kew).

Wood used for tool handles (Punch, l.c.), and by the natives as scantling and for walking sticks (Thompson, List of For. Trees, S. Nigeria, 1910, p. 3).

One of the trees prohibited from being felled on native lands without a licence (Forestry Ordinance, l.c.).

Diospyros sp. (no specimen in the Kew Herbarium).

Vernac. name.—Isanwi (Benin, Thompson, List of Forest Trees, S. Nigeria, 1910, p. 3).

Given as one of the Benin ebony trees, rather quick growing.

A tree under the name of Isinewey is said to be very prevalent all over the western side of [Central] Province S. Nigeria, not usually of large size, wood hard and reddish-brown, valued at 2d.–3½d. per foot on the English market as a mahogany (Kew Bull. 1908, p. 194).

Ebony is one of the chief fancy woods of commerce and the name as applied to the various woods is almost as indefinite as that of mahogany. The chief sources are W. African—Gaboon, Cameroon, Rio del Rey, Old Calabar, etc. (*Diospyros Dendo* and *D. mespiliformis*); Ceylon, India, Macassar? (*D. Ebenum*) and Madagascar (*Diospyros haplostylis*, *D. Perrieri*, etc.) *See also* "Mozambique Ebony" (*Dalbergia melanoxylon*) p. 237. All the ebonies of commerce, however, agree in being heavier than water, in the dark colour, usually black, sometimes brown, in the hard close texture and small billet like sections. Rough billets 3–4 ft. in length, 2½–8 in. in diam., 45–50 pieces to the ton, are characteristic of Gaboon and Cameroon Ebony; irregular logs 2½–3 ft. in length; 45–60 pieces to the ton, for Rio del Rey, etc., etc. (Kew Bull. 1908, p. 185). Stained woods of close grain, as Box (*Buxus sempervirens*), Pear (*Pyrus communis*), etc., are not uncommon to meet the demand for ebony, but the genuine article can easily be recognised in being black throughout.

The uses generally of the wood are for cabinet work—inlaying chiefly, pianoforte keys, backs of brushes, chessmen, rulers, walking sticks, etc.

Ref.—"Ebony and Its Varieties," Simmonds in The Art Journal, 1872.——A Monograph of Ebenaceae, Hiern, pp. 1–300 pls. i.–xi. (Univ. Press, Cambridge, 1873).——"Madagascar Ebony," Kew Bull. 1888, pp. 135–136.——"Ebony" (various) in Timbers of Commerce, Stone, pp. 150–155.——Ebène, Dubard, in L'Agric. prat. pays chauds, xi. part 2, 1911, "Etude de Quelques Bois Types," pp. 116–119.

SALVADORACEAE.

Salvadora, Linn.

Salvadora persica, *Garcin*; Fl. Trop. Afr. IV. Sect. 1, p. 23.

Ill.—Vahl, Symb. Bot. Pl. i. t. 4; Lam. Encycl. t. 81; Roxb. Pl. Corom. t. 26; Gaertner, Fruct. Sem. Pl. iii. t. 222; Schnizlein, Ic. t. 117*; Wight. Ic. Pl. Ind. Or. iv. t. 1621, f. A; Wight. Illust. t. 181 (*S. indica*); Baillon, Adansonia, ix. t. 10, ff. 4–8 (fl. fr.).

Vernac. names.—Arak (Turk. *Speke* and *Grant*); Aràk (Arabic Palestine, *Vester* and *Co.*; Arab, *Dymock*, *Warden* and *Hooper*, Sudan, Imp. Inst.); Darakht-i-Miswák (Persia, *Royle*, *Dymock*, *Warden* and *Hooper*); Kegr (N. Nigeria, Imp. Inst.); Khardal (Syrian Arabs, *Royle*, *Hooper*); Hiro (W. Africa, *Chevalier*); Suarki (Port. E. Africa, *Allen*); Arrack or Muswak (Mus. Kew).—Salt bush, Mustard tree, Tooth-brush tree.

Lake Chad, N. Nigeria (Elliott, No. 146, Herb. Kew); Bornu, region of Lake Chad (Vogel, Herb. Kew); found also throughout Tropical Africa, etc.

Twigs used as a tooth-cleaner by the natives, Port. E. Africa (Allen, Herb. Kew), Nile Banks (Grant, Herb. Kew; Trans. Linn. Soc. xxix. p. 106), Sudan (Bull. Imp. Inst. ix. 1911, p. 209), but otherwise the wood is of little value, not recommended even for fuel. It is white and soft and weighs about 45 lb. per cubic ft.

The shoots and leaves are pungent, eaten as salad and given as fodder to camels; the fruits—pungent, bitter and aromatic—are with the leaves and shoots used as a relish, and used medicinally (Gamble, Man. of Ind. Timb. p. 477; Watt, Dict. Econ. Prod. India). The root bark is acrid and vesicant.

A vegetable salt called "Kegr" is obtained from the ash of this plant in Northern Nigeria (Col. Rep. Misc. No. 46, 1908, p. 5; Bull. Imp. Inst. 1912, p. 304).

The seeds yield about 45 per cent. of fat, suitable for the manufacture of candles.

A shrub or small tree, easily reproduced from seed, though of slow growth; common on the shores of Lake Chad (Elliott, Herb. Kew); growing in dense clumps from 3–10 ft. high near Shibam, Hadramaut (Lunt. Herb. Kew), sea coast 3000–4000 ft., Nubia (Bent, Herb Kew), etc.

Ref.—*Salvadora persica: Salvadora oleoides*, in Pharmacographia Indica, Dymock, Warden, and Hooper, ii. pp. 380–384. ——"*Salvadora persica*," in Dict. Econ. Prod. India, Watt, vi. part 2, B, 1893, pp. 448–450.——"Salt prepared from the Salt-bush (*Salvadora persica*)," in Col. Rep. Misc. No. 46, 1908, pp. 5–6.——A Short Account of *Salvadora* Fat, Hooper, in Agric. Ledger, No. 1, 1908, pp. 1–5.——"Ash of *Salvadora persica*," in Bull. Imp. Inst. x. 1912, pp. 304–306, with analysis, from N. Nigeria.——"*Salvadora persica* Seeds," in Col. Rep. Misc., No. 88, 1914, pp. 571–572, with analysis.

APOCYNACEAE.

Landolphia, Beauv.

Landolphia florida, *Benth.*; Fl. Trop. Afr. IV. Sect. 1, p. 38 and p. 590.

Ill.—Kotschy, Pl. Tinneana, t. 13 a; Engl. Bot. Jahrb. xv. 1892, p. 404, f. 1 B, p. 405, f. 2 (*L. comorensis* var. *florida*); Engl. and Prantl. Pflan. iv. pt. 2, f. 50 B, f. 51 (*L. comorensis*, var. *florida*); Engl. Pflan. Ost. Afr. B. p. 456, f. 19, p. 458, f. 20 B (*L. comorensis*, var. *florida*); Jumelle, Pl. Caoutchouc, p. 55, f. 8; Köhler, Med. Pflan. iii. (*L. comorensis*, var. *florida*); Sadebeck, Kulturg. Kolon. p. 271, f. 105 (*L. comorensis*, var. *florida*); Tropenpfl. iii. 1899, p. 311, f. G; Warburg, Kautschukpfl. p. 117, f. G; Schlechter, Westafr. Kautsch. Exp. p. 68; Journ. de Bot. Paris, xv. 1901, p. 84, f. 4; De Wildeman and Gentil, Lianes, Congo, tt. 11, 12; Pobéguin, Fl. Guin. Franç.

t. 31; Sim. For. Fl. and For. Res. Port. E. Afr. t. 78, f. A; Engl. and Drude, Veg. Erde, ix. p. 225, f. 198.

Vernac. names.—Ibo-gidi (W. Prov. S. Nigeria, *Thompson*); Chiwo (Bassa, *Elliott*); Ebo (Shinga, N. Nigeria, *Dudgeon*); Abo or Aboh (Nupe, *Barter*); Bihi (Golo, Bahr-el-Ghazal, *Broun*); Alguluar (Arabic, Blue Nile, *Muriel*); Mukonja (Chindao, *Swynnerton*); Umkonza (Singuin, *Swynnerton*); Matuti, Dituti or Rituti (Golungo Alto, *Welwitsch*); Ponguendole (Lubefu, *De Wildeman*); Mulemu (Uganda, *Dawe*); Mbungu (Zanzibar, *Morris, Holmwood*); Mbungu (Dar Salem, *Kirk*); Mantchocongo (Lower Congo, *Baudon*).

Nupe, Bassa, Kontagora, Lagos, etc., and widely distributed in Tropical Africa.

This was formerly believed to be one of the important sources of African rubber, but Dawe (Uganda), Schlechter (Congo), De Wildeman and Gentil (Congo) Hua and Chevalier (Senegal, Sudan and French Guinea), Purves (Nyasaland, *var. leiantha*, Herb. Kew) all agree that it is of no value. Dudgeon (Nos. 21, 64, N. Nigeria, in Herb. Kew) describes it as the source of "Ebo paste rubber" made by boiling the latex with an equal quantity of "balsam of copaiba" (*Daniellia thurifera*); though it is not so used in the Gambia (Agric. and For. Prod. W. Afr. p. 9) Monteiro (Angola, in Herb. Kew) states that "the indiarubber of the South-West Coast is derived from this creeper. "Ibo rubber" is very resinous and of little commercial value, it is sometimes collected by the natives in Kontagora, both from the root and stem (Dalziel, Bull. Imp. Inst. 1907, p. 262).

The fruit is edible, though according to Barter (Herb. Kew) very sour; eaten in Nupe; aromatic, milky, edible, agreeably acidulous and the most appreciated of all the fruits of the genus by the Natives of Golungo Alto (Hiern, Cat. Welw., Afr. Pl. l.c. pp. 662, 663).

A large woody climber, sometimes 1 ft. or more in diameter (De Wildeman and Gentil), with white scented flowers; in ravines, Kontagora (Dalziel, Herb. Kew), abundant on ironstone, Bahr-el-Ghazal (Broun, Herb. Kew), in nearly all the primeval forests in the interior of Angola, at an altitude of 1500–2500 ft. (Hiern, l.c.), common throughout Uganda (Dawe, Rep. Bot. Miss. For. Dist. Uganda, 1906, p. 50).

Ref.—"*Landolphia comorensis*, var. *florida*, in Med. Pflan. Köhler. iii. $4\frac{1}{2}$ pages.——"*Landolphia florida*," Hua and Chevalier, in Journ. de Bot. Paris, xv. 1901, ["Les Landolphiées (lianes à caoutchouc) du Sénegal du Soudan et de la Guinée Francaise"], pp. 83–86.——"*Landolphia florida*," in Notizblatt Bot. Gart. Berlin, No. 45, 1909, pp. 115–116; and see the works referred to under Illustrations.

Landolphia owariensis, *Beauv.*; Fl. Trop. Afr. IV. Sect. 1, p. 49.

Ill.—Pal. de Beauv. Fl. Ow. Ben. i. t. 34; Lam. Encycl. t. 930; Collins, Caoutchouc. t. 221; Clouth, Gummi Gutt. and Balata, p. 17, f. 8; Bot. Centralb. lxi. 1895, t. 2, ff 13–21 (anatomical);

Morris, Journ. Soc. Arts, xlvi. 1898, f. 14; Schlechter, West Afr. Kautsch. Exp. p. 128, p. 9 (*L. Heudelotii*); De Wildeman and Gentil, Lianes, Congo, tt. 1–2 and 21, ff. 5–8 (seedlings); De Wildeman, Mission E. Laurent. t. 152 (leaves showing veining), p. 460, f. 87 (fruits), p. 461, f. 88 (de la liane donnant à la fois du caoutchouc elastique et du caoutchouc poisseux) and pp. 462–470, ff. 89–97; Engl. and Drude, Veg. Erde, ix. p. 636, f. 547 (nach De Wildeman); Thompson, Col. Rep. Misc. No. 66, 1910, t. 22; Bull. Agric. Congo Belge, ii. 1911, p. 226, f. 117, p. 300, f. 157 (9 ans), p. 301 f. 158 (9 ans) and p. 306, f. 161.

Vernac. names.—[Ottafrifredi (Ibo); Ubamiogon (Benin, *Thompson*)]; Ibo Tabong (Mamu, *Foster*, Yoruba, *Thompson*); Uboikwankwan, Ugbo (Ugara, Benin, *Unwin*); Arobo (Bassa, *Elliott*); Otuokpo (Ibo, Degema, *Sherriff*); [Foré (Dubreka), Banga (Banda, Chari-chad); Don (Mandjias, Chari-Chad) *Chevalier*]; Mvoochi (Congo, *Phillips, Moloney*); Fure, *Oro* (Sierra Leone, *Scott Elliot*); Lilibue (Timni, Sierra Leone, *Cardew, Willey*); Njogo, (Sierra Leone, *Smythe*); Pumpuni, Pauia, Kiakia, Abontire (Gold Coast, *Chipp*); Abontire, Kiakia, (Gold Coast, *Johnson*); Krepi (Volta R. Gold Coast, *Dudgeon*); Krepi, Pempene (Gold Coast, *Evans*); Inkontomba (Gold Coast *Williams, Armitage*); Licongue, Macomgue (Angola, *Welwitsch*).—White Rubber Vine, Vine Rubber.

Widely distributed in West and South-West Africa.

One of the most important sources of West African vine rubber, yielding the "white rubber," "Pempene rubber" and "Krepi ball" of the Gold Coast, and also believed to be the source of the "Nigger ball" of Sierra Leone, "Rio Nunez Niggers," "Accra Niggers," "Conakry Niggers," "Addah Niggers," "Congo Red," —Thimble Rubber. "Jandunko (Cluster)" Rubber, the value of which may vary from about 1s. 6d. to 2s. 6d. per lb.

The rubber is collected by making rough cuts in the bark with a machete, a little lime-juice is poured on the exuding latex which soon coagulates and may then be collected and rolled off in a ball. A dozen or more vines may be cut and treated with lime-juice before beginning to collect. In many localities, however, the destructive method of cutting down the vines is prevalent. The latex coagulates very quickly on exposure, especially in the dry season, but under certain conditions as in wet regions or wet season it may have to be collected in vessels. In Sierra Leone the vine is tapped in some localities and the latex coagulated with the aid of salt or lime-juice, though the more destructive method is most usual (Dudgeon, Agric. and For. Prod. W. Afr. p. 25).

An infusion of the plant "Bosanga" (*Costus lucanusianus*) is mentioned (Col. Rep. Misc. No. 51, 1908, p. 37; Gambia Govt. Gaz. 24th Aug. 1907, p. 284) as being sometimes used by the natives for coagulating the latex. The rubber from the dry bark may also be extracted by machinery. The yield from a large vine has been given at from $\frac{1}{3}$–$\frac{2}{5}$ of a lb. annually (Thompson, Col. Rep. l.c. p. 37).

Proclamations No. 7 of 1905 (The Forestry Proclamations 1901 and 1905) Section 17, dated Old Calabar, 4th August, 1905, for S. Nigeria (Govt. Gaz. S. Nigeria, Aug. 18, 1905), Order No. 26, of 1912, in Govt. Gaz. S. Nigeria, Sept. 4th, 1912, and No. 9, 1913, Section 7, coming into operation 30th Aug. 1913 (see N. Nigeria Gaz. Extraordinary, No. 16, Aug. 21, 1913) were issued to prevent the destruction of rubber vines.

The cultivation owing to the slow growth and uncertain yield has not met with any success, though the rubber is one of the best on the market. Some experimental plantations on the Ivory Coast begun in 1906 have not induced the natives there to take up the cultivation (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 134), and the planting of rubber vines in the Congo Free State has been going on since 1900 until (1913) it was estimated that 12,000,000 were growing in the various plantations, without profit, the cost of planting not having been returned. Experiments there have shown that 64 lb. of rubber from 800 plants on an acre of ground could be expected after 10 years growth (Cons. Rep. Ann. No. 5043, 1913, p. 20).

In its wild state the vine climbs to a great height especially in the moist evergreen forests near the coast—a stem 3–6 in. thick in the primitive forests but only 2–3 in. in secondary woods, Angola (Hiern, Cat. Welw. Afr. Pl. iii. p. 661); a somewhat scandent shrub, 10 ft., Onitsha (Barter, Herb. Kew), merging as its growing area extends towards the drier regions of the hinterlands of all the West African Colonies, into an insignifiant plant of bushy habit with little or no value in the parts above ground for rubber production. The Gold Coast *Landolphia owariensis* "is purely a jungle plant and climber, but when found in the open country it seems to develop a tuberous [thickened] rubber-yielding root, specimens of which have been collected in the Northern Territories and identified at Kew" (Report Agric. Dept. Gold Coast, 1908, p. 9), and in the more open dry country of Nigeria, where forest fires are prevalent this vine has a tendency towards shrubby and rhizome development (Thompson, Col. Rep. Misc. No. 51, 1908, p. 36). These views are supported by specimens which may very properly be referred to the following variety.

var. **Djenge**, *Stapf.*

[*L. Heudelotti*, var. *Djenge*, Stapf, Journ. Linn. Soc. xxx. (1894) p. 87; Fl. Trop. Afr. iv. Sect. 1, p. 55; *L. owariensis*, var. *nigerina*, Chev. MSS.]

Vernac. names.—Djenje (Sierra Leone, *Scott Elliot, Dudgeon*); Djenje (Mendi, Sierra Leone, *Dudgeon*, *Unwin*); Ubakae, Ubachie, or Obachi (Ogodo, Asaba, Benin, *Unwin*); Pore? (Sierra Leone, Imp. Inst. No. 3, 1905, Herb. Kew); Attifufu or Ati-fufu (Bassa, N. Nigeria, *Elliott*, *Dudgeon*).—Root rubber of S. Nigeria, the "Brown Cluster" or "Brown Medium" of the trade.

Southern Nigeria (Colonial Office, Aug. 4, 1905, Herb. Kew; Thompson, No. 1, Aug. 1905, Herb. Kew); Ogodo, Asaba, S. Provinces, Nigeria (Unwin, No. 2, 1906, Herb. Kew); Sierra

Leone (Imp. Inst. No. 3, 1905; Smythe, No. 82, 1907; Scott Elliot, No. 4650, 1892, Herb. Kew), and probably occurs in the drier parts of all the West African Hinterlands.

The so-called "root-rubber" is not the same as that from the rhizomes of *Landolphia Thollonii*, or of *Clitandra Henriquesiana*. It is collected from actual roots and probably from stems that have been covered with earth in the forest by some accidental circumstance. It is common to see vines covered for several feet near the base or lying on the ground at some distance from the tree over which it climbs. It was reported in 1906 that the bulk of the so-called "root rubber" from the Niger Valley is prepared from this plant (Thompson, Col. Rep. Misc. No. 51, 1908, p. 37, *Landolphia owariensis*), and in Northern Nigeria the natives were in the habit of digging up the roots of this and other Landolphias indiscriminately to the destruction of large areas (Elliott, Col. Rep. Ann. No. 476, 1905, p. 130).

In collecting the rubber from the "Ubachie" or "Ubakae" plant as a rule the roots only are cut, and the stems are left to die. The collected roots are dried for a day or two and then beaten with wooden mallets until all the bark comes off, the bark is further beaten to remove the dry woody particles, and the resulting mass of roughly coagulated rubber is boiled, giving a product of a reddish colour (Unwin, Enclosure in letter, Colonial Office to Director Kew, May 1st, 1905). [A small sample of this rubber is preserved in the Museum at Kew.]. In Sierra Leone the "Djenge" Vine is cut down, the roots dug out, and both stem and root are cut into small pieces, soaked in water for several weeks; the bark is then removed and the wood pounded and washed repeatedly until a reddish mass of rubber remains, which is made up into balls—the "red nigger" rubber of commerce (Dudgeon, Agric. and For. Prod. W. Afr. p. 25). Unwin also records a similar destructive method of extracting the rubber from this vine (Rep. Forests, Sierra Leone, 1909, p. 36).

The value of the rubber is about equal to that of the typical species, some being valued (1906) at 3s. 9d. per lb. in London when fine hard Para was selling at 5s. 5½d. per lb. (Col. Rep. Misc. No. 82, 1912, p. 356).

Ref.—"Rubber," in Sketch of Forestry of W. Africa, Moloney, pp. 78–95, chiefly *L. owariensis* (Sampson, Low, etc., London, 1887).——"*Landolphia owariensis*," Hua and Chevalier, in Journ. de Botanique, Paris, xv. 1901, "Les Landolphiées (lianes à caoutchouc) du Sénégal du Soudan et de la Glinée Française," pp. 74–76.——"*Landolphia owariensis*," in Lianes Caoutchoutiféres de L'Etat Indépendant du Congo, De Wildeman and Gentil (Bruxelles, 1904), pp. 51–58.——"*Landolphia owariensis*," in Mission E. Laurent (1903–04), De Wildeman, pp. 458–473 (Imprimerie F. Vanbuggenhoudt, Bruxelles, 1905–07).——"*Landolphia owariensis*," Chevalier, in L'Agric. prat. pays chauds, iii. 1903–04, "Les Plantes a Caoutchouc de la Région Chari-Tchad," pp. 56–66.——"*Landolphia owariensis*," Thompson, in Report on the Forest Administration of Southern Nigeria

for 1906; Col. Rep. Misc. No. 51, 1908, pp. 36–37; methods of tapping, etc.——"*Landolphia owariensis*," De Wildeman, in Notices sur des Pl. Utiles ou Intéressantes de la Flore du Congo, pp. 189–200, including vars. *rubiginosa* and *tomentella*.——"Le *Landolphia owariensis* et sa variété *rubiginosa*, Chevalier, in L'Agric. prat. pays chauds, x. 2, 1910, "L'Expl. Caout. et la Cult. des Pl. Prod. au Dahomey," pp. 25–26.——"Landolphia Rubber from the Sudan," in Bull. Imp. Inst. viii. 1910, pp. 263–264; *L. owariensis* var. *tomentella*, with analysis.——"Expériences de saignée de lianes à caoutchouc et de battage des Écorces." Seret, in Bull. Agric. du Congo Belge, i. 1910, pp. 45–51.——"*Landolphia owariensis*," Claessens, in Bull. Agric. Congo Belge, ii. 1911, "Récolte du Caoutchouc par entaille de L'Écorce, Procédé Indigène," pp. 300–309.——"*Landolphia owariensis*, in Bull. Agric. Congo Belge, ii. 1911, "Caoutchouc gerende Lianen," pp. 225–227.——"Krepi Ball Rubber" and "Pempeneh Rubber," Gold Coast, in Col. Rep. Misc. No. 82, 1912, pp. 362–363, with analyses.—"Jenje Rubber," l.c. p. 356.——"Cultivation of Rubber-growing Vines in Central Africa," De Wildeman, in The Rubber Industry: Official Report Fourth Inter. Rubber Congress, Torrey & Manders (1914) pp. 87–95.

Landolphia scandens, *Didr.*; Fl. Trop. Afr. IV. Sect. 1, p. 44.

Ill.—Engl. Bot. Jahrb. xv. 1893, p. 408, t. 12 f. A (*L. Petersiana*, var. *crassifolia*).

Vernac. names.—Ibo (Ilaro, *Foster*); Ibo (Lagos, *Dawodu*); Ottafrifredi, Ottapabeku, Otopi, Otonta (Ibo, Cent. Prov. S. Nigeria, *Thompson*); Ubamiogon (Benin, *Thompson*).

Lagos—road to Ilaro (Millen, No. 105, 1893, Herb. Kew); Lagos (Foster, No. 68, 1906; Moloney, 1883, Herb. Kew); Asaba (Unwin, No. 14, 1906, Herb. Kew); and found also in the Gold Coast and Lower Guinea—Congo, Angola, etc.

Yields inferior rubber, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 184), a rubber which is very plastic, Lagos (Millen, l.c.) a straggly shrub with milky juice, Krobo Plains, Gold Coast (Johnson, No. 494, 1899, Herb. Kew).

Landolphia senegalensis, *Kotschy & Peyr.*; Fl. Trop. Afr. IV. Sect. 1, p. 36.

Ill.—Journ. de Bot. Paris, xv. 1901, p. 84, f. 4 B.; Pobéguin, Fl. Guin, Franç. t. 30.

Vernac. names.—Ibo Akitipa (Yoruba, *Thompson*); Sabia (W. Africa, *Chevalier*); Made, Mada, Pétigué, Folé grandi, Kaba, Saba, Sagona, Sikonkenad, Sidipason, Bintipobon, Bengdé, Dabri, Dabirite, Mi, Lingui (French W. Africa, various parts, *Hua* and *Chevalier*).

Senegambia; French Guinea, Gambia, etc.

There is no specimen in the Kew Herbarium from Nigeria, but according to Dudgeon (Agric. and For. Prod. W. Afr. p. 98) the latex in S. Nigeria is made into "root" and "paste rubber" of inferior quality, like that of *Carpodinus hirsuta*, and Thompson

(Col. Rep. Misc. No. 51, 1908, p. 39) states that the latex after prolonged boiling forms a resinous putty-like substance, which remains plastic for years, and that the price on the home markets [1906] varies from 8d. to 9d. per lb. The yield of latex is plentiful and difficult to coagulate by either acids or alkalis (l.c.) and much the same opinion is expressed by Hua and Chevalier (Les Landolphiées du Sénégal, du Soudan et de la Guinée Franç. (Journ. de Bot. Paris, xv. 1901) p. 29), who mention that some manufacturers suggest a possible use for mixing with rubber in the manufacture of ebonite.

According to Chevalier (Bull. Soc. Nat. d'Accl. France, 1912, p. 134) the vines are preserved in the villages of the French Middle-Soudan for the sake of their edible fruits.

A powerful climber reported to be very common in the Western Province, S. Nigeria (Thompson, l.c.)

Ref.—"*Landolphia senegalensis*, Hua and Chevalier, in Journ. de Bot. Paris. xv. 1901, "Les Landolphiées du Sénégal, du Soudan, et de la Guinée Française," pp. 79–83: Reprint, pp. 25–29 (Augustin Challamel, 17 Rue Jacob, Paris, 1901).

Landolphia Thompsonii, *Chev.* in Bull. Soc. Bot. France, lviii. 1911; Mem. viii. (1912) p. 182.

A strong growing vine, up to about 90 ft. high of about the size of a man's arm near the base. Leaves glabrous, ovate-elliptic, often wedge-shaped at the base, shortly and obtusely acuminate at the apex, about 4–6 in. long, 2–3 in. broad, with 8 pairs of lateral nerves. Inflorescence terminal, compact, about 2–3 in. across, corolla yellowish-green and finely pubescent. Fruit globose about $2\frac{1}{2}$ in. by 2 in. in diameter, with apex slightly depressed including a central umbo; epicarp $\frac{1}{4}$ in. thick, (in spirit material of a cheese-like consistency) having irregular annular thickenings; seeds 15–20, set in a woolly pulp, hard and bony, $\frac{3}{4}$ by $\frac{3}{8}$ by $\frac{1}{4}$ in., oval in section across the centre.

Vernac. name.—Ibo Giddi (Yoruba, *Thompson,* Oloke-Meji, *Foster*).

Ibadan, Lagos (Punch, No. 45, 1900, Herb. Kew); Lagos (Foster, No. 28, 1905, Herb. Kew); Oloke-Meji (Foster, No. 112, 1907, Herb. Kew), Forests of Agilile, Lagos (Millen, No. 166, Herb. Kew); Benin City (Thompson, No. 12, 1906, Herb. Kew); Asaba (Unwin, No. 5, 1906, Herb. Kew), and known also from the Ivory Coast and Dahomey.

Yields inferior rubber, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 184). The particulars given under *L. senegalensis* (Dudgeon and Thompson) apply also to this species, and Dudgeon (Agric. and For. Prod. W. Afr. p. 122) further questions this as the source (with *L. florida*, q.v.) of "Ebo paste rubber." This is prepared from the latex by boiling with an admixture of "wood oil" or the resinous exudation of *Daniellia thurifera* (see p. 270) until it reaches the consistency of bird-lime, when it can only be handled in water. In this state it is sold to the merchants who accumulate it in casks for shipment.

This is one of the plants called "Ibo," according to Punch (No. 45, Herb. Kew) who also states that the juice will not coagulate into good rubber.

Clitandra, Benth.

Clitandra cirrhosa, *Radlk.*; Fl. Trop. Afr. IV. Sect. 1, p. 67.

Oban, S. Nigeria (Talbot, Nos. 1537, 1351, 1912, Herb. Kew ex Herb. Brit. Mus.) found also in the Cameroons and the Gaboon.

Fruit edible (Zenker, Herb. Kew; Fl. Trop. Afr. l.c.).

According to Foureau this vine yields good caoutchouc; which the natives, coagulate by rubbing the latex on their chests, afterwards stretching it into threads and rolling it into small cylindrical masses about an inch thick and 4 inches long (Bonnet, Mus. Hist. Nat. Paris, vii. 1901, p. 283).

A climbing shrub.

Clitandra elastica, *A. Chev.* in Bull. Soc. Bot. de France, liii. (1906), p. 19.

A climber up to 60 ft. in height. Bark verrucose owing to the presence of numerous lenticels. Young branches flattened, glabrous. Leaves oblong elliptic or sometimes broadly elliptic, glabrous on both sides, dark green above paler below, about 4–6 in. long by about $1\frac{1}{2}$–3 in. wide. Petiole sub-cylindrical, 4–5 lin. long. Fruit spherical, size of a mandarin orange, containing 3 to 5 seeds of the dimensions 6 by 4 by $2\frac{1}{2}$ lin.

Vernac. names.—Ubabikpan (Benin, *Thompson, Unwin*); Marodi (Bassa, *Elliott, Chevalier*); Marodi (Benin, *Unwin*).

Sapobo, W. Prov. S. Nigeria (Thompson, No. 15, 1906, Herb. Kew); Old Calabar (Chevalier, No. 13626, 1905, Herb. Kew, 1907); Bassa, N. Nigeria (Elliott, No. 98, 1904, Herb. Kew).

Yields good black rubber (Thompson, l.c.); samples in biscuit form of "Ubabikpan" rubber varying from brown to black externally, white within when freshly cut, of very good quality was valued (1908) at 2s. 8d. to 2s. 10d. per lb. with fine hard Para at 3s. $5\frac{1}{2}$d. per lb. (Govt. Gaz. S. Nigeria, *seq.*; Col. Rep. Ann. No. 630, 1909, p. 38; Bull. Imp. Inst. vii. 1909, p. 259; Col. Rep. Misc. No. 82, 1912, p. 364) and a sample of "Marodi," a thick ($\frac{3}{8}$–$\frac{1}{2}$ in.) rough biscuit (6 in. diam.) of brown rubber, was valued (1908) at 2s. 6d. per lb. in England, with fine hard Para at 3s. 1d. per lb. (Bull. Imp. Inst. and Col. Rep. Misc. l.c. and Govt. Gaz. S. Nigeria, 15th July, 1908, Suppl).

The latex is copious and coagulates after dilution with water, by heating (Thompson, Col. Rep. Misc. No. 51, 1908, p. 37; Dudgeon, Agric. and For. Prod. W. Afr. p. 98). The diluted latex is boiled in an earthen pot and continually stirred with a stick till coagulation sets in. During the process the rubber adheres to the stick in a spindle-shaped mass; it is then removed, crushed flat and taken to the nearest market (Thompson, l.c. p. 37). A large proportion of the rubber exported from Calabar is reported to come from this plant (l.c.), and according to

Chevalier (Bull. Soc. Bot. France, liii. 1906, p. 19; De Wildeman, Pl. Util. Congo, ii. 1908, Art. viii. p. 218) it is with *Landolphia owariensis* the principal source of vine rubber on the Ivory Coast. "Red ball," one of the so-called "Root rubbers" of the Southern Provinces, Nigeria, is attributed to this species (Unwin, Mus. Kew, Rep. MSS. Benin, 1907).

A valuable rubber-yielding vine, abundant in parts of Southern Nigeria (Col. Rep. Ann. No. 512, 1906, p. 25); shoots up from the base after the stem has been cut below the surface of the ground (Unwin, l.c.).

Ref.—"*Clitandra elastica*," in Col. Rep. Misc. No. 51, 1908, Forestry Administration, S. Nigeria (1906), pp. 37–38.——"Results of the Examination of Ubabikpan Rubber (*Clitandra elastica*) from Southern Nigeria," in Govt. Gaz. S. Nigeria, April 1st, 1908, Suppl. pp. iii.–iv.——"Results of the Examination of the Rubber of the Marodi Vine from Southern Nigeria," Dunstan, in Govt. Gaz. S. Nigeria, 15th July, 1908, Suppl.——"Ubabikpan Rubber (*Clitandra elastica*)," in Bull. Imp. Inst. vii. 1909, pp. 258–259, with analysis; and in Col. Rep. Misc. No. 82, 1912, p. 364.——"Rubber of the 'Marodi' Vine (1908)," in Bull. Imp. Inst. vii. 1909, pp. 259–260, with analysis, and in Col. Rep. Misc. l.c. p. 364.

Clitandra visciflua, *K. Schum.*; Fl. Trop. Afr. IV. Sect. 1, p. 66.

Ill.—Hallier, Kautschuklianen, in Jahrb. Hamburg Wiss. Anst. xvii. (1899), Beih. 3, t. 4, ff. 1–5 (partly).

Vernac. names.—Ubake (Benin, *Unwin*), Olute? (Colonial Office, 1884, C. M. Thompson, Herb. Kew).

Benin City (Unwin, No. 51, 1906, Herb. Kew); found also in the Cameroons.

Yields an inferior extract used for mixing with the latex of other rubbers.

Carpodinus, R. Br.

Carpodinus Barteri, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 77.

Vernac. names.—Ibo (Ilaro, Lagos, *Punch*); [Akwaerri (Asaba); Akhe (Benin), Offonkwari, Ottaekwari, Ottarniaha, Offioniola (Ibo) *Thompson, Unwin*].

Lagos (Barter, Rowland, Moloney, Millen, Punch); Asaba (Unwin); Old Calabar (Mann, Chevalier); New Calabar-Degema (Holland); Agege (Foster).

Moloney describes this as a "rubber yielding creeper common in the bush" (No. xi. 1883, Herb. Kew), and Punch (No. 43, 1900, Herb. Kew) states "native name 'Ibo'—a climbing shrub with milky juice which does not coagulate into good rubber." No other collector of the specimens available mentions anything of the rubber and it is probable that at best it is only "paste."

Carpodinus dulcis, *Sabine*; Fl. Trop. Afr. IV. Sect. 1, pp. 76, 598.

Ill.—Hook. Ic. Pl. t. 2568; Journ. de Bot. Paris, xv. 1901, p. 117, A, A^1 (fruits); Hua and Chevalier, Les Landolphiées, Sénégal, Soudan, Guin. Franç. p. 33, f. 5, A, A^1 (fruits); De Wildeman and Gentil, Lianes Congo, f. 8, A (fruits).

Vernac. names.—Codoudou (Bambara, *Chevalier*); Ouennyi (Sousson, *Chevalier*, *Bouéry*); Ovengi (French Guinea, *Farmar*); Kushument (Sierra Leone, *Scott Elliot*); Pishamin (Sierra Leone, *Scott Elliot*, *Don*).

Senegambia, Sierra Leone, French Guinea, Bambarra.

Fruit edible, Sierra Leone (Kirk, Scott Elliot, Herb. Kew); the coagulated latex used as bird-lime by the natives, Sierra Leone (Scott Elliot, Herb. Kew), of no value as rubber.

Ref.—"*Carpodinus dulcis*," in "Les Landolphiées (Lianes à Caoutchouc, du Sénégal, du Soudan et de la Guinée Française," Hua et Chevalier, pp. 32–34 (Augustin Challamel, Paris, 1901), Reprint from Journ. de Botanique, Paris, xv. 1901, pp. 116–118.

Carpodinus fulva, *Pierre*; Fl. Trop. Afr. IV. Sect. 1, p. 87.

Ill.—De Wildeman, Mission E. Laurent, t. 161.

Gaboon.

Mentioned as yielding an inferior quality of rubber, in the Central Division, S. Nigeria (Thompson, Col. Rep. Ann. 512, 1906, p. 23), in the Mamu Forests (*Ibid.* Col. Rep. Misc. No. 51, 1908, p. 5) and common on the Niger (l.c. p. 38).

Carpodinus hirsuta, *Hua*; Fl. Trop. Afr. IV. Sect. 1, p. 77.

Ill.—Journ. de Bot. Paris, xv. 1901, p. 117, f. B (fruit), De Wildeman and Gentil, Lianes, Congo, p. 101, f. 8 B (fruit).

Vernac. names.—[Ibo Elekiti (Yoruba); Ubanikwi? (Benin), Ottogwi? (Ibo) (*Thompson*)]; Ibo (Lagos, *Moloney*, *Higginson*); Ama Papu (Lagos, *Moloney*); Aribedda (Bassa, *Elliott*, *Dudgeon*); Ake (Asaba, *Unwin*).

Lagos, Asaba, Cross River, in S. Provinces Nigeria; Bassa, Gurara River, in N. Provinces, Nigeria; also on the Gold Coast.

Yields a rubber of inferior quality known as "Flake Rubber," "Paste Rubber," "Alibida Rubber," and one of the so-called "root-rubbers" (see Col. Rep. Misc. No. 51, 1908, pp. 5, 38). The latex is largely employed to adulterate that of *Funtumia elastica* (Thompson, Col. Rep. Misc. No. 66, 1910, p. 44); coagulated by boiling into a sticky product of the consistency of bird-lime, and only saleable in Europe at a low price (Dudgeon, Agric. and For. Prod. W. Afr. p. 98), value locally, Asaba, 6d. per lb. (Unwin, Mus. Kew, MSS. Report, 1907). These views are borne out by an analysis of "Flake Rubber" from Northern Nigeria which shows this to contain only 9·4 per cent. of caoutchouc with the high proportion of 88·8 per cent. of resin (Col. Rep. Misc. No. 82, 1912, p. 365). A common vine in the dry zone and on the Niger river banks (Dudgeon, l.c.), in the Onitsha hinterland Oka district, where it has been practically exterminated by the practice of extracting the root rubber (Thompson, Col. Rep. Misc.

No. 51, 1908, p. 38) and likewise in the Asaba district (Unwin, Mus. Kew, l.c.).

Ref.—"*Carpodinus hirsuta*," Hua and Chevalier, in Journ. de Botanique, Paris, xv. 1901, "Les Landolphiées (lianes à caoutchouc) du Sénégal, du Soudan et de la Guinée Française," p. 118–120.——"Flake Rubber from *Carpodinus hirsuta*, Hua (1906), Northern Nigeria," in Col. Rep. Misc. No. 82, 1912 [Selected Rep. etc., Imp. Inst. iv. Rubber and Gutta Percha], p. 365, with analysis.

Carissa, Linn.

Carissa edulis, *Vahl*; Fl. Trop. Afr. IV. Sect. 1, p. 89.

Ill.—Delile, Centurie Pl. Afrique, Voyage Méroé, Caillaud, t. 2, f. 1; Jaubert et Spach, Illust. Pl. Orient. t. 495, t. 496 (*C. Richardiana*); t. 499 (*C. Candolleana*); t. 498 (*C. cornifolia*); Engl. and Drude, Veg. Erde, ix. p. 117, f. 99.

Vernac names.—Mtanda Mbo (Nyika, E. Trop. Africa, *Wakefield*); [Jingongono (Loanda); Munhiangolo (Huilla) *Welwitsch*]; Kamboro (French Guinea, *Pobéguin*).

Oloke-Meji (Dodd, No. 476, 1909, Herb. Kew); Katagum (Dalziel, No. 336, 1908, Herb. Kew), also known from Sierra Leone, Gold Coast, Togo, Angola, Congo, extending through Nile Land to Brit. E. Africa, Mozambique, etc.

Fruit edible, black, flavour agreeable, much like sweet cherries, makes an excellent soup for the sick (Hooker, Niger Fl. p. 446; Moloney, For. of W. Afr. p. 384), black and very sweet (Wakefield, Herb. Kew), red when ripe (Dalziel, Herb. Kew), black or black-purple, pleasantly acidulous (Hiern, Cat. Welw. Afr. Pl. iii. p. 664), very dark blue-black, similar to damson-plum, agreeable flavour (Nelson, Herb. Kew, var. *major*, Stapf, Transvaal). The leaves are used, boiled, and pounded, in applications for toothache, French Guinea (Pobéguin, l.c.).

Found as a much branched or climbing shrub; 6 ft. or more, bristling with very strong and sharp spines, flowers whitish-rosy, very fragrant, Loanda (Welwitsch, in Hiern, l.c.), a shrub with spines and white flowers, Oloke-Meji (Dodd, Herb. Kew); "scented jasmine" with straight double thorns, Madi, Uganda (Speke and Grant, Herb. Kew), a very fragrant shrub on plains near Masaka, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 50), commonly on clay, slate and sandstone, B. E. Africa (Scott Elliot, Herb. Kew) and in ravines by streams, Katagum (Dalziel, Herb. Kew).

The spiny character of the plant, together with its white fragrant flowers and useful fruit suggests its use for making hedges after the manner of those made by the "Amatungula" (*C. grandiflora*) of Natal, where it is said to make the finest hedge (Fairchild, U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 25, 1903, p. 16). The spines are an inch long, straight; corolla entirely red before the flower opens, the clusters of buds being very brilliant (Grant, Trans. Linn. Soc. xxix. p. 107).

Propagated from seeds; transplanted when large enough to handle conveniently to permanent places. A foot apart in alternate rows is recommended by Medley Wood (l.c. p. 17) for *C. grandiflora*, the plants of which, trimmed often, interweave their tough thorny branches and make an impenetrable barrier against stock.

Picralima, Pierre.

Picralima Klaineana, *Pierre*; Fl. Trop. Afr. IV. Sect. 1, p. 96.

Ill.—Hook. Ic. Pl. tt. 2745–2746.

Agege, S. Nigeria (Foster, No. 220, Herb. Kew), Old Calabar (Robb, Fl. Trop. Afr. l.c.); also on the Gold Coast, Ambas Bay.

Extensively used by the natives, Gold Coast, in place of quinine (Oppenheimer, Son & Co. Herb. and Mus. Kew).

A tree 30–80 ft. high. Wood light yellowish in colour, takes a good polish; weight per cubic foot 44 lb. of a specimen in the Museum, Kew, from Ambas Bay (Mann. No. 18).

Pleiocarpa, Benth.

Pleiocarpa mutica, *Benth.*; Fl. Trop. Afr. IV. Sect. 1, p. 98.

Ill.—Hook. Ic. Pl. t. 1181; Engl. and Prantl, Pflan. iv. part. 2, f. 52 C-D; Bot. Mag. t. 8343; Gard. Chron. April 22, 1911, p. 242.

Cross River (Johnston, Herb. Kew, 1888); Old Calabar River (Mann, No. 2277, Herb. Kew); Adiabo, Old Calabar (Holland, No. 106, 1898, Herb. Kew); also in the Cameroons.

An ornamental plant introduced to European horticulture from Old Calabar, remarkable for the profusion of beautiful small white flowers borne in clusters in the axils of the leaves.

Grows freely in stove in this country; found wild as a shrub 5 ft. high, Old Calabar River (Mann, l.c.).

Thevetia, Linn.

Thevetia neriifolia, *Juss. ex Steud.* Nom. ed. 2, ii. p. 680.

A shrub or small tree. Stem sometimes reaching 6 in. in diameter. Leaves alternate, narrow, 4–6 in. long, sessile glaucous green. Flowers yellow, corolla funnel-shaped, about 2–3 in. long. Fruit same colour as the leaves when fresh, and when the thin fleshy skin is removed disclosing a hard light brown nut $1\frac{1}{2}$ by $\frac{1}{2}$ by $\frac{3}{4}$; this divided into two along a deep groove at the base looks in section like two right angled triangles, with the hypotenuse somewhat rounded; two seeded.

Ill.—Plumier, Ic. Burm. i. t. 18 (*Cerbera foliis*, etc.); Jacq. Icon. Select Stirp, Am. t. 34 (*C. Thevetia*); Ruiz Lopez, and Pavon, Fl. Peruv. ii. t. 153, f.b. (*C. Thevetia*); Dict. Sc. Nat. t. 56; Bot. Mag. t. 2309 (*C. Thevetia*); Tuss. Ant. iv. t. 7 (*C. thevetia*); Mart. Fl. Bras. vi. part 1, t. 10, f. 2 (fl. and fruit); Cooke, Oil Seeds and Oils, India, p. 36, f. 19 (fruit); Journ. Bombay N.H. Soc. viii. t.j.

Vernac. names.—Cabalonga (Porto Rico, *Cook* and *Collins*); Ahouai (Antilles, *Tussac*); Ahouai (Guyane, *Heckel*); Marathi

(India, *Kirtikar*); Pila-Kanér (Hindustani, *Dymock*, *Watt*); Kaneer (United Prov. India, Ann. Rep. Bd. Sci. Advice, India, 1911–12, p. 13).—Yellow Oleander, Exile tree, Linear leaved Cerbera, Milk Bush.

Native of Tropical America and the West Indies. Cultivated in India, Malaya, West Africa—Old Calabar, Lagos, etc.

The bark is used medicinally—a powerful antiperiodic (Planchon and Collin, Les Drogues Simpl. i. p. 732) as a febrifuge, India (Dict. Econ. Prod. India).

Seeds yield an oil called "Exile oil," in India (Cooke, Oil Seeds and Oils, India p. 36); perfectly liquid at ordinary temperatures, specific gravity 0·9148 at 25°C. (Ann. Rep. Bd. Sci. Advice, India, 1911–12, p. 13). The seeds have been known to poison cattle and all parts of the plant are poisonous, the active principle resembling digitalis in its action; they are in addition to their morphological characters distinguished by giving a blue colour with hydrochloric acid (l.c.).

The seeds, called "lucky seeds" or "lucky beans" in the West Indies are used as charms.

A handsome decorative shrub easily grown from seed, stands cutting well and makes a good hedge.

Ref.—"*Thevetia neriifolia,*" in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 406–410 (Trübner and Co. Ltd. London, 1891).——"*Thevetia neriifolia,*" in Dict. Econ. Prod. India, Watt, vi. part. 4, 1893, pp. 47–48.——"*Thevetia neriifolia,* Juss. (*Cerbera Thevetia,* Wild)," Kirtikar in Journ. Bombay Nat. Hist. Soc. viii. 1894, "The Poisonous Plants of Bombay," pp. 453–461.

Polyadoa, Stapf.

Polyadoa umbellata, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 103. [*Carpodinus umbellata,* K. Schum. in Engl. Jahrb. xxiii. p. 221.]

Ill.—Hook. Ic. Pl. t. 2762.

Vernac. names.—Erin (Yoruba, *Thompson*); Osu (Benin, *Unwin*).—Yellow wood.

Lagos (Foster, No. 5, 1906, Herb. Kew); Ibadan Forest (Punch, No. 138, 1900, Herb. Kew); S. Nigeria (Unwin, May 1906, Herb. Kew); found also in the Cameroons.

A small tree with very hard wood (Punch, l.c.); one of the trees prohibited from being felled on Native lands without a licence (see Forestry Ordinance, Order No. 26, of 1912, Govt. Gaz. S. Nigeria, Sept. 4, 1912, p. 2242, and Schedule, p. 2244); grows 24–30 ft. high.

Polyadoa Elliottii, is also a tree with hard wood used by the natives Sierra Leone for making combs (Scott Elliot, No. 5690, Herb. Kew).

Rauwolfia, Linn.

Rauwolfia vomitoria, *Afzel.*; Fl. Trop. Afr. IV. Sect. 1, p. 115.

Vernac. names.—Ira (Ebute Metta, *Millen*); Akata (Benin,

Thompson, *Unwin*); Asofeyeye (Lagos, *Dawodu*); Iraigbo (Nigeria, specimen in Herb. Kew, No. 11, Imp. Inst. 1905); Akake (Sierra Leone, *Scott Elliot*); Ounoudo (Gaboon, *Klaine*); Gonguon-Kiur, Embi-Siembi (Ivory Coast, *Chevalier*).

Ebute Metta, Lagos; Benin (Unwin, No. 32, 1906, Herb. Kew); Abeokuta, Ibadan, Old Calabar, Cross River, etc., and widely distributed in Upper and Lower Guinea from Senegambia to the Cameroons, the Gaboon and Lower Congo, extending to Uganda, and Mozambique.

Roots and leaves used medicinally for children, and in gonorrhoea, Lagos (Dawodu, No. 6, 1899, Herb. Kew). A "Craw craw" medicine Sierra Leone (Scott Elliot, No. 5501, 1892, Herb. Kew). Wood white when freshly cut, changing to rose colour on exposure, grain fine, density 0·361 (Chevalier, Bois Cote d'Ivoire, in Les Vég. Util. L'Afriq. Trop. Franç. fasc. v. 1909, p. 144).

Found as a small tree, sometimes a shrub, flowers white, River Nun (Barter, Herb. Kew), fruit scarlet, Nupe (Barter, l.c.), greenish flowers, Komaiko grounds, Lagos (Dawodu, No. 6, 1899, Herb. Kew).

Allamanda, Linn.

Allamanda neriifolia, *Hook.* Bot. Mag. t. 4594.

An evergreen shrub of scandent habit. Leaves oblong acuminate, glabrous, deep green above, paler below. Inflorescence a panicle, terminal, also occurring freely on young side shoots. Calyx 5-lobed ovate-lanceolate, spreading. Corolla, infundibuliform, deep yellow, streaked with orange; stamens and pistils included in the cup or tube.

Ill.—Bot. Mag. t. 4594; Lemaire, Le Jard. Fl. ii. 1852, t. 177; Fl. des Serres, ix. 1853–54, t. 905; Rev. Hort. 1859, p. 372, f. 84; p. 373, f. 85; L'Horticulteur Francais, iii, 1861, t. 17.

Native of Tropical America. Cultivated in Botanic Gardens, Old Calabar, Lagos, etc.

Propagated by seeds or cuttings; grows and flowers freely in rich loam. A handsome ornamental plant suitable for trellis work.

Allamanda cathcartica, *Linn.* var. **Hendersonii**, *L. H. Bailey*, Stand. Cycl. Hort. ii. (1914) p. 247.

An evergreen shrub of somewhat similar habit to the foregoing, but growth more straggling. Leaves, large, lanceolate, acuminate tapering at the base, arranged in whorls of 3 or 4; petiole short, with small acute stipulary glands. Inflorescence paniculate, terminal and also arising from the axils of the leaves. Calyx in 5 leaf-like segments. Corolla infundibuliform-campanulate, larger than in *neriifolia*, rich yellow, the colour deepening inside; the limb divided into 5 rotundate, spreading, segments.

Ill.—Moore and Ayres, Mag. Bot. iii. 1851, p. 233; Ill. Hort. 1864, t. 452 (var. *Hendersonii*); Dombrain, Floral Mag. v. t. 263 (var. *Hendersonii*); Weiner, Ill. Garten-Zeitung, 1894, t. 1 (var.

Hendersonii); Gard. Chron. Jan. 11th, 1913, p. 24, Suppl.; Rev. Hort. Belge, 1913, p. 371 (var. *Hendersonii*); Bailey, l.c. f. 155.

Native of Brazil.

A handsome decorative plant widely grown in Botanic Gardens in the Tropics, the var. *Hendersonii*, with its larger and richer flowers being usually preferred to the species proper.

The variety *Schottii*, L. H. Bailey, l.c. (Pohl, Pl. Bras. i. t. 58; Bot. Mag. t. 4351) is an equally handsome plant, commonly grown in gardens and the type plant (see Bot. Mag. (1795) t. 338) is now almost superseded by these varieties. Treatment under cultivation as for *A. neriifolia*.

Lochnera, Reichb.

Lochnera rosea, *Reichb.*; Fl. Trop. Afr. IV. Sect. 1, p. 118.

Ill.—Miller, Figures, Beautiful and Uncommon Pl. Desc. Gard. Dict. ii. t. 186 (*Vinca foliis*, etc.); Gaertner, Fruct. Sem. Pl. ii. t. 117 (*Vinca rosea*); Cahier, Pl. et. Arb. t. 8 (*V. rosea*); Bot. Mag. t. 248 (*V. rosea*); Redouté, Choix Fl. t. 100 (*V. rosea*); Drapiez, Herb. Amat. de Fleurs. ii. t. 100 (*V. rosea*); Mag. Bot. and Gard. iv. 1836, t. 47, f. 6 (*V. rosea*); Schnizlein, Ic. t. 132, ff. 2, 3; Mart. Fl. Bras. vi. pt. 1, t. 25, f. 2 (*V. rosea*); Engl. and Prantl, Pflanz. iv. pt. 2, f. 57 A–D.

Vernac. names.—Pervenche (Madagascar, *Drapiez*, *Chevalier*, *Redouté*).—Madagascar periwinkle.

Oloke-Meji. Widely spread in Tropical Africa. Naturalised in the Tropics.

Leaves used for feeding horses, Oloke-Meji (Dodd, No. 430, 1908, Herb. Kew).

A handsome decorative plant cultivated in gardens, first grown in England in 1757, originally from Madagascar.

Easily raised from seed or cuttings.

Plumeria, Linn.

Plumeria rubra, *Linn.*; Fl. Trop. Afr. IV. Sect. 1, p. 120.

Ill.—Merian, Metamorph. Surinaamsche, t. 8 (*Jasminum indicum*): Sloane, Hist. Jamaica, ii. t. 185 (*Nerium arboreum*, etc.); Catesby, Nat. Hist. Carolina, Florida and Bahama Is. ii. t. 92 (*Plumeria flore roseo, etc.*); Bot. Mag. t. 279; Lam. Encycl. t. 173; Tuss. Ant. iii. t. 20; Bot. Reg. 1824, t. 780; Desc. Ant. iv. t. 297; Geel, Sert. Bot. ii.; Drapiez, Herb. Amat. de Fleurs, vii. t. 523; Rchb. Exot. iii. t. 175; L'Hort. Univ. Paris, v. 1844, p. 261.

Vernac. names.—Jasmin Mangueira (Loanda, *Welwitsch*); Franchipanier (Antilles, *Descourtilez*, *Tussac*).—Frangipanni, Jasmine Tree, Red Jasmine of Jamaica.

Probably native of Central America, very common in Mexico, Guiana, the West Indies; cultivated in many parts of the tropics and probably throughout Tropical Africa.

The flowers, bark, root and the latex are used for various medicinal purposes in French Guiana (Heckel, Les Pl. Med. et Toxiq. Guy. Franç. in Ann. L'Inst. Col. Mars. iv. 1897, p. 114).

The extract more especially that from the young branches has been found to contain a fair proportion of caoutchouc, an analysis showing 25·5 per cent., with 21·9 per cent. resinous matter and 15·7 per cent. water (Journ. Soc. Arts, lxi. 1912, p. 149).

The plant is easily raised from cuttings (strong ends of the branches a foot or more long) and thrives in sandy or stony soil with a rainfall of about 25 inches and upwards; grows quickly and is very desirable for decorative purposes, though the stems have a somewhat bare appearance if not kept lopped regularly.

Ref.—"New Rubber Yielding Plants in Mexico," in Bull. Imp. Inst. viii. 1912, "*Plumerias*," pp. 46–47.——"A New India Rubber Producing Plant," in Journ. Roy. Soc. Arts, lxi. 1912, pp. 148–149.

ALSTONIA, R. Br.

Alstonia congensis, *Engl.*; Fl. Trop. Afr. IV. Sect. 1, p. 121.

Ill.—Revue Cult. Col. vii. 1900, p. 492, 493 (*Alstonia scholaris*); Chevalier, Geog. Bot. Sénégal et Soudan, p. 207, 224 (*A. scholaris*).

Vernac. names.—Ebu (Owerri, *Sherriff*); Uhu (Benin, *Dennett*); Ukhu (Benin, *Unwin*); Awun, Ogudugbu ? (Ibadan, *Punch*); Ahun or Awun (Yoruba, *Thompson*); Niamidua, Sindru, Bakunin, or Nimeribaka (Gold Coast, *Chipp*); Lerué or Leroi, Emien, Kokué (French Ivory Coast, *Chevalier*); Bantang foro (Mandingue, *Chevalier*).

Throughout the Southern Provinces, Nigeria. Found from Senegambia to the Lower Congo, E. Africa, etc.

Wood used for making native stools, Ashanti (Thompson, Col. Rep. Misc. No. 66, 1910, p. 20), bowls, spoons and furniture, S. Nigeria (Thompson, List of For. Trees, S. Nigeria, 1910, p. 8); in cabinet work for interior finishing, etc., of furniture, Ivory Coast (Chevalier, Bois Cote d'Ivoire, in Les Vég. Util. L'Afriq. Trop. Franç. fasc. v. 1909, p. 121); used for boats and war drums, Bahr-el-Ghazal, Sudan (Broun, No. 920, Herb. Kew). It is light, white and soft. Chevalier (l.c.) gives a density of 0·391, and a specimen of the woody root (with bark) from S. Nigeria has specific gravity 0·304 = 19 lb. per cubic foot.

The latex is used to adulterate that of good rubber, S. Nigeria (Dudgeon, Agric. and For. Prod. W. Afr. p. 99) for adulterating that of *Funtumia elastica* and other latices, Gold Coast (Thompson, l.c.; Armitage, Report, Rubber Trees and Vines, Encl. in Letter Col. Office to Director, Kew, Nov. 30th, 1898); for adulterating good rubber, but will not coagulate properly by itself, Ibadan (Punch, No. 145, 1900, Herb. Kew), and as bird-lime by the natives, Benin (Unwin, Mus. Kew).

The bark is used, and also the roots, for medicinal purposes by the natives, S. Nigeria (Thompson, List. For. Trees, l.c.), Gold Coast (Armitage, Report, Rubber Trees and Vines, l.c.).

Found as a lofty tree common in the moist forests Southern Provinces, Nigeria (Col. Rep. Misc. No. 51, 1908, p. 39) 60 ft.

high. Idda and Aboh, 40 ft. high, Brass (Barter, Herb. Kew); 50 60 ft. high, Mabira Forest, Uganda, at an altitude of 4000 ft. (Dawe, Herb. Kew); a large tree, Benin (Dennett, Herb. Kew), Bahr-el-Ghazal, Sudan (Broun, Herb. Kew), Ibadan Forest Reserve, the leaves shedding to some extent during flowering (Punch, Herb. Kew), and a large tree over 20 ft. in circumference, no flowers from Feb. to May, Cross River (McLeod, Herb. Kew). A shade tree for coffee, Casamance (Chevalier, Geog. Bot. Sénég. et Soudan, p. 207, *A. scholaris*). "Sindura," which is found everywhere grows to a height of about 150 ft. and its trunk resembles that of the Silk Cotton Tree, Gold Coast (Armitage, l.c.).

Callichilia, Stapf.

Callichilia Barteri, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 133.

Ill.—Bot. Mag. t. 5859 (*Tabernaemontana Barteri*).

Vernac. names.—Agbo omode or Ommode (Yoruba, *Moloney, Millson*); Agbo ommodo (Sierra Leone, *Scott Elliot*); Oko-aja (Ibo, Lagos, *Foster*).

Lagos, Ibadan, Brass, Eppah, Onitsha, Old Calabar, Etoi River—Obeyon, and generally in the Southern Provinces.

All the citations in the flora (l.c.) are with the exception of one—Gold Coast (Burton) from Nigerian specimens. The references to Sierra Leone above and below are not supported by specimens.

Used medicinally, Ikirun (Yoruba) (Millson, Kew Bull. 1891, p. 212) Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 49).

An ornamental shrub 6–8 ft. high. the first specimens known being those of Barter who describes it (No. 3357, 1859, Herb. Kew) as "a beautiful little shrub, habit of *Gardenia florida*, flowers large, white, very fragrant, common in open places as far inland as Ojaye." Living plants were first sent from Old Calabar to Edinburgh Botanic Gardens, and a specimen sent thence to Kew flowered in 1870 (Bot. Mag. l.c.).

Conopharyngia, D. Don.

Conopharyngia durissima, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 143. [*Tabernaemontana durissima*, Stapf, Kew Bull. 1894, p. 24.]

Gaboon (Soyaux); Cameroons (Zenker); Bangin-chari-Lac-Tchad. Thomson No. 73, 1863, Old Calabar (in Herb. Kew) with Holland, No. 4, 1897, Itu, Cross River, are referred to this species provisionally.

Wood very hard (Soyaux, Herb. Kew).

A tree 30–70 ft. high (Fl. Trop. Afr. l.c.).

Conopharyngia pachysiphon, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 145. [*Tabernaemontana pachysiphon*, Stapf, Kew Bull. 1894, p. 22.]

Vernac. names.—Dodo (Lagos, Oloke-Meji, *Dodd*); Ibu or Ubu (Benin, *Dennett*); *Kpokpoka (Lagos, *Gurney*).

Lagos, Ibadan, Oloke-Meji, Benin, Onitsha.

Latex used to adulterate that of good rubber (Punch, No. 146, 1901, Herb. Kew; Thompson, Col. Rep. Misc. No. 51, 1908, p. 39). Fibre used for making cloth, of which there is a *sample in the Kew Museum called "Dodo Cloth," Lagos (Gurney, Mus. Kew).

Found as a small tree about 10 ft. high, Oloke-Meji (Dodd, Herb. Kew), fine foliage, flowers white and very fragrant, Onitsha (Barter, Herb. Kew).

The *Conopharyngias* in common with other Apocynaceous plants all have a milky juice, coagulating to an inferior substance more or less sticky, sometimes used as bird-lime, and to adulterate good class rubbers, though one species *C. stenosiphon*, Stapf, Fl. Trop. Afr. l.c. p. 147, is stated to yield sparingly a very good rubber. *C. Holstii*, Stapf, l.c. p. 146, of East Africa and Uganda, is said to possess very hard wood. *C. crassa*, Stapf, Fl. Trop. Afr. l.c. p. 144, has been mentioned as a rubber plant (see Morris Journ. Soc. Arts, xlvi. 1898, p. 778) and cultivated unsuccessfully as such in Ceylon (see Warburg, Pl. Caoutch. (1902) p. 208); it yields a sticky latex, and the wood is described as yellowish-white, of fine grain, and density 0·302–0·636 (Chevalier, Bois Cote d'Ivoire, in Les Vég. Util. L'Afriq. Trop. Franc. Fasc. v. p. 121).

Voacanga, Thouars.

Voacanga africana, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 157.

Ill.—De Wildeman, Etudes Fl. Bangala, p. 125, f. 48.

Vernac. names.—[Igbo (Benin), Giwini (Yoruba), Dodo (Lagos), *Foster*]; Dodo—the so-called Male of—(Ibadan, *Punch*).

Lagos, Adiabo (Old Calabar); Ibadan, Abeokuta, Benin, in S. Provinces, Nigeria; Abinsi, Nupe, Lokoja, in N. Provinces, Nigeria. Extends from Sierra Leone to the Cameroons.

Its latex, which will not itself coagulate, is used for adulterating that of good rubber, Ibadan (Punch, Herb. Kew).

Found as a shrub, 5–10 ft., Nupe, Lagos (Foster, Barter, Millen, Herb. Kew), a low bush, summit of Mt. Patti, Lokoja (Elliott, Herb. Kew), flowers white, fragrant (Barter), in fruit [Jan. 6th, 1912], sea front Axim (Chipp, Herb. Kew).

Holarrhena, R.Br.

Holarrhena africana, *A.DC.*; Fl. Trop. Afr. IV. Sect. 1, p. 164.

Vernac. name.—Jawki or Yawki (Sierra Leone, *Scott Elliot*).

Sierra Leone (Scott Elliot); French Guinea, Togo (Schlechter).

Fluff [or so-called feathers] of the seed used for stuffing pillows, Sierra Leone (Scott Elliot, No. 4469, Herb. Kew; Col. Rep. Misc. No. 3, 1893, p. 29).

A shrub or small tree. There are no specimens from Nigeria, but the species is mentioned here as having been involved with the following (*q.v.*) occurring in Lagos (see Kew Bull. 1896, pp. 47–49), and Thompson (Col. Rep. Misc. No. 51, 1908, p. 39)

mentions that the latex is used in the Western Province, S. Nigeria, to adulterate that of good rubbers.

Ref.—See under *H. Wulfsbergii.*

Holarrhena Wulfsbergii, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 164.

Ill.—Wulfsberg, Holarrh. Afr. Inaug. Diss. tt. 1–3 (*H. africana,* ff. 1–7); L'Agric. prat. pays chauds, vii. 2, p. 16 (habit, with *Funtumia elastica*), p. 18 (leaf, fl. and seed), p. 19 (follicles).

Vernac. names.—Ireno (Ibadan, *Punch*); Ire-Ibeji or Ako-Ire (Yoruba, *Thompson*); Ako Ire (Oloke-Meji, *Foster*); Ire Basabasa (Lagos, *MacGregor, Dawodu*); Isai (Lagos, *Moloney*); Ire? (Bassa, *Elliott*); Kromi or Gbomi (Gold Coast, *Wulfsberg*).—Male of the Ire (*Denton*) or "Male Rubber Tree."

Lagos (Moloney, 1883; Foster, No. 46, 1906, Herb. Kew); Abeokuta (Barter, No. 3334, 1859, Herb. Kew); Mt. Patti, Lokoja (Dalziel, No. 208, 1908, Comm. Imp. Inst. 1909); Ibadan (Punch, 1901, Herb. Kew). The Gold Coast, etc.

The bark, steeped in palm wine is said to be a native cure for dysentery (Kew Bull. 1896, p. 48, *H. africana*, and see Wulfsberg, l.c.). The medicinal properties are regarded as being similar to those of *H. febrifuga*, Klotzsch, Fl. Trop. Afr. iv. Sect. 1, p. 162, the "Quina" of the Portuguese in Mozambique, "Kumbanzo" of the Zambesi (see Kew Bull. l.c. and Livingstone Missionary Travels, p. 648), the bark of which is used in fever, suggested as a substitute for quinine. *H. antidysenterica* has similar uses in India (Dict. Econ. Prod. India).

The latex will not coagulate (Punch, Herb. Kew), is used to adulterate that of good rubbers, S. Nigeria (Thompson, Col. Rep. Misc. No. 51, 1908, p. 39; Dudgeon, Agric. and For. Prod. W. Afr. p. 99).

The wood is used by the natives for making images, combs and handles of matchets, S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 8).

A shrub, Mt. Patti, Lokoja (Dalziel, forma *tomentosa*, Herb. Kew); a shrub or small tree, Abeokuta (Barter, Herb. Kew); Gold Coast (Brown, Herb. Kew); a tree 50 ft. Kwabu, Gold Coast (Johnson, Herb. Kew); flowers white and fragrant (Barter).

Ref.—Holarrhena africana, DC. eine Tropische Apocynacées, Inaugural-Dissertation . . . . Wulfsberg, pp. 1–31 (Druck der Dieterichschen Univ.—Buchdruckerei W. Fr. Kaestner, Gottingen, 1880).——"Two African Holarrhenas (*Holarrhena africana*, A.DC., and *H. febrifuga*, Klotz.)," in Kew Bull. 1896, pp. 47–49.——"Faux Ireh, *Holarrhena Wulfsbergii*, Stapf," Luc. in L'Agric. prat. pays chauds, vii. 2, 1907, pp. 16–19.

Strophanthus, DC.

Strophanthus Barteri, *Franch.*; Fl. Trop. Afr. IV. Sect. 1, p. 177.

Ill.—Nouv. Arch. Mus. Paris, 3rd ser. v. (1893), t. 11 A; Engl. Monogr. Afr. Pflan. *Strophanthus,* t. 10, f. G (seed).

Abeokuta (Barter, No. 3346, Herb. Kew); Lagos (Rowland, Herb. Kew); Ivory Coast, Gold Coast.

Juice stated to be a rubber coagulant (Chipp, List of Trees, Gold Coast (1913), p. 28); used by the natives of the Ivory Coast for coagulating rubber (Chevalier, Journ. d'Agric. Tropicale, ix. 1909, p. 226). The method employed is one part of the juice to 30 parts of latex, the mixture is stirred quickly for from 5 to 10 minutes, and the clots of rubber which form are afterwards washed in water to remove the deposit on the surface produced by the juice (l.c.; Agric. News, Barbados, 1909, p. 393).

Strophanthus gratus, *Franch.*; Fl. Trop. Afr. IV. Sect. 1, p. 170.

Ill.—Bot. Mag. t. 4466 (*Roupellia grata*); Fl. des Serres, vi. (1850) t. 589 (*R. grata*); Paxton, Fl. Gard. i. (1850) p. 71, f. 46 (*R. grata*); Lemaire, Le Jard. Fl. i. (1851) t. 16 (*S. Stanleyanus*); Blondel, Strophanthus du Commerce, p. 34 (*S.* "glabre du Gabon"); Nouv. Arch. Mus. Paris, 3rd ser. v. (1893) t. 9 (*S.* "glabre du Gabon"); Planchon, Produits Apocynées, p. 66 (*S.* "glabre du Gabon"), p. 69, f. 10 (trans. section of seed); Payrau, Strophanthus, [t. 3 f. 6 (seed nat. size), t. 5, f. 2 (trans. sections of seed × 300), t. 9, f. 3 (seed tegument × 200) *S.* "glabre du Gabon"]; Tropenpfl. 1902, p. 559, f. 3; Engl. Monogr. Afr. Pflan. *Strophanthus*, t. 9 A and p. 18, f. 1; Gilg, Strophanthus-Frage (1904) t. 1.

Vernac. names.—Isa (Lagos, *Dawodu*); Ishu Ogbugbu (Oloke-Meji, *Foster*); Isha Gidi (Lagos, *Fraser*).—Cream Fruit.

Oloke-Meji (Foster, No. 139, Herb. Kew); Lagos (Millen, No. 174, and Rowland, Herb. Kew); Brass (Burrows, Herb. Kew). Known also from the Benue River (Flegel, Herb. Berol. Engl. Monogr. *Strophanthus*, p. 18), Sierra Leone, Cameroons, etc.

Used for poisoning arrows, Oloke-Meji (Foster, Herb. Kew), Ebute Metta (Millen, Herb. Kew).

A climber; under cultivation (Hope Gardens, Jamaica); common near Brass, S. Prov. Nigeria (Burrows, Herb. Kew), plentiful in the interior, cultivated near the coast, Lagos (Millen, Herb. Kew); found in Sierra Leone at an altitude of 2000 ft. (Smythe, Herb. Kew). A handsome flowering plant, may be propagated by seeds which are distinguished from the Strophanthus seeds of commerce by being glabrous. The seeds of this species are recommended for use in medicine in preference to those of any other chiefly because they yield "crystalline strophanthin," whereas the established official *Strophanthus* (see the two following species), etc., yield this glucoside in an amorphous condition (see Gilg. *seq.* p. 46; Pharm. Journ. *seq.* and Merck's Ann. Report, *seq.*).

Ref.—"Strophanthus Glabre du Gabon," in Produits fournis à la Mat. Méd. Apocynées, Planchon, pp. 64–72 (Montpellier, 1894).——"Strophanthus Glabre du Gabon," in Recherches sur les Strophanthus, Payrau, pp. 111–118 (Soc. d'Edit. Scientifiques, Paris, 1900).—Die Strophanthus-Frage: Bot., Pharm. Chem. (Bericht Deutsch. Pharm. Gesells.), Gilg, Thoms and Schedel, pp. 1–48 (Berlin, 1904).

Strophanthus hispidus, *A. P. DC.*; Fl. Trop. Afr. IV. Sect. 1, p. 174.

Ill.—Ann. Mus. Paris. i. (1802) t. 27, f. 2; De Candolle, Strophanthus, tt. 4, 5; Trans. Roy. Soc. Edin. xxxv. t. 3; Köhler, Med. Pflan. ii.; Planchon, Produits Apocynées, p. 36, f. 1, p. 41, f. 2 (seed); Engl. and Prantl. Pflan. iv. pt. 2, f. 60; Payrau, Strophanthus, tt. 1, 2, 4, 7 (anatomical—leaf, seed, fruit); Tropenpfl. 1902, p. 555, f. 2; Engl. Monogr. Afr. Pflan. *Strophanthus*, t. 2; Engl. and Drude, Veg. Erde, ix. f. 551.

Vernac. names.—Isha Gere or Isha Giri (Lagos, *Foster, Fraser*); Isa (Lagos, *MacGregor*); Aguah or Arguah (Abeokuta, Akassa, Nupe, *Barter*); Inée or Onaye (West Africa, Journ. Soc. Arts xxxv. p. 996); Kwankwanni, Toke (Yola, *Dalziel*).

Lagos (Foster, MacGregor, Rowland), Abeokuta, Akassa (Barter, Herb. Kew), Old Calabar (Thomson, Mann) in Southern Provinces, Nigeria; Kabba (Parsons), Nupe (Barter), Bassa (Elliott), Lokoja (Lugard, Elliott), Kontagora (Dalziel), Zungeru (Lugard), in Northern Provinces, Nigeria. Extends from Senegambia to the Cameroons.

Seeds are an important drug, worth about 2s. to 2s. 6d. per lb. wholesale, commonly shipped in the pods, but more often taken out, freed from the awns and packed in bales.

The seeds are poisonous, the active principle being "Strophanthin"; used in Nigeria and generally in Tropical Africa for arrow poison—the "Arrow poison of Nupe with some *Euphorbia* furnish the poison with which the natives smear their arrows" (Barter, Mus. Kew); "Arrow poison universally throughout Northern Nigeria is prepared from the seeds as the sole indispensible ingredient" (Dalziel, Kew Bull. 1909, p. 139); in Brazzaville, Congo, properties of the seeds are well known to the natives, but they do not use it as a poison (Baudon, Pl. Ec. du Bas-Congo in Ann. Mus. Col. Marseille, vii. 1909, p. 395); may be propagated by seed, but the commercial supply is obtained so far from wild plants—strong climbers making the seed difficult to collect, though according to Dalziel (Bull. Imp. Inst. 1907, p. 264) as a shrub with long lax branches it is capable of being grown in the neighbourhood of towns and villages. The seed pods are available in October at Abepa, Kabba Province, where the plant is said to be plentiful (Parsons, No. 151, 1908, Herb. Kew). Seeds take several months to ripen. Billington reports (Chem. and Druggist, Jan. 28, 1893, p. 157) collecting a pod in October, then not quite ripe, after noting its development for ten months.

Ref.—"*Strophanthus hispidus*," in Med. Pflanzen, Köhler, ii. 4 pp.——"Note on *Strophanthus hispidus*," Holmes, in Col. Rep. Misc. No. 1, 1891 (Gold Coast), pp. 23–25, from Pharm. Journ. [3] xxi. 1890, pp. 233–234. ——"*Strophanthus hispidus*," in Produits fournis à la Matière Médicale, par la Famille des Apocynées, Planchon, pp. 33 44 (Imprimerie Central du Midi, Hameline Frères, Montpellier, 1894).——"*Strophanthus hispidus*," in

Recherches sur les Strophanthus, Payrau, pp. 47–70 (Paris, 1900). ——"Gutachten über den arzneilichen Wert von *Strophanthus hispidus* und *Kombe*," Lewin, in Tropenpflanzer, vi. 1902, pp. 560–561. See also references at end of the genus.

Strophanthus Kombe, *Oliv.*; Fl. Trop. Afr. IV. Sect. 1, p. 173.

Ill.—See the works of Blondel, Planchon, Payrau, Engler, Engler and Drude, mentioned under *S. hispidus*, and the references to illustrated works given below.

Vernac. names.—Kombe (Nyasaland, *Purves*); Inée, Onaye, Onage, Gombé (Centr. Afr. *Christy*).

Found chiefly in Nyasaland and northwards on the East Coast from Portuguese East Africa, etc., whence the commercial supplies are largely drawn. This plant is the chief source of the Strophanthus seeds of commerce though the seeds of *S. hispidus* are equally important as a drug, and with those of other species (*S. grattus*; *Emini*, *Thollonii*, etc.) may be imported under the name "Kombe." From Nyasaland the exports have been 10,178 lb., value £2544, in 1904; 32,878 lb. value £8219, in 1905; 31,477 lb., value £3935, in 1906; and 29,394 lb. value £3674, in 1907 (Chem. and Druggist, 13th Feb. 1909, p. 274). The export price from Nyasaland was 1s. per lb. in 1914, when the returns showed a decrease of 92·6 per cent. (Col. Rep. Ann. No. 832, 1915, p. 13) owing no doubt to the loss of the German market. See under *S. hispidus* for general particulars, also the following references together with those at end of the genus.

Ref.—"The Kombé Arrow Poison (*Strophanthus*) of Africa," Fraser, in Pharm. Journ. [3] iii. 1873, pp. 523–524.—— "*Strophanthus Kombé*: Kombé Arrow Poison," etc., in New Comm. Pl. and Drugs, Christy, No. 9, 1886, pp. 53–61.—— A Contribution to the Pharmacognosy of Official Strophanthus Seed: Historical Résumé of the Kombé Drug up to the Time of its Introduction into Medical Practice, Perrédès, No. 15, 1900, The Wellcome Chemical Research Laboratories, pp. 1–28; plates i. viii. with list of references to literature.——"The *Strophanthus Kombe* Seed of Commerce," Holmes, in Pharm. Journ. [4] xii. 1901, pp. 486–489.——"A New Admixture of Commercial Strophanthus Seed," Perrédès, in Pharm. Journ. [4] xii. 1901, pp. 518–521, Reprint, No. 17, The Wellcome Chemical Research Laboratories.——"Strophanthus Rules," No. 198, of 1913 (made under the Forests Ordinance of 1911, Section 14), published for general information in The Nyasaland Govt. Gazette, Aug. 30th, p. 177.

Strophanthus Preussii, *Eng.* & *Pax.*; Fl. Trop. Afr. IV. Sect. 1, p. 176.

Ill.—Nouv. Arch. Mus. Paris, 3rd ser. v. (1893), t. 12 (*S. bracteatus*); Payrau, Strophanthus, tt. 3, 5, 8 (*S. bracteatus*); Engl. Monogr. Afr. Pflan. *Strophanthus*, t. 4, f. A; Bot. Mag. t. 8250.

Vernac. names.—Omartwa-nini (Twi, Gold Coast, *Tudhope*); Diecha (Gold Coast, *Tudhope*).

Old Calabar, Lagos, Otta Egbah Country in Nigeria; Fernando Po; Gold Coast.

The juice is used on the Gold Coast for coagulating the latex of *Funtumia elastica* (Imp. Inst. No. 1110, Nov. 3rd, 1909, Herb. Kew); the "diecha" juice has been found to contain tannin and it is suggested that the coagulating action like that of an infusion of Bauhinia leaves (see p. 263) may be due to this constituent (Col. Rep. Misc. No. 82, 1912, p. 325).

A strong climber, and though not the showiest plant of the genus it is very decorative and grows freely in rich loamy soil.

Ref. –"Funtumia Rubber prepared by means of the juice of the Diecha Vine, *Strophanthus Preussii*," in Col. Rep. Misc. No. 82, 1912, pp. 324–325.

Strophanthus sarmentosus, *DC.*; Fl. Trop. Afr. IV. Sect. 1, p. 180.

Ill.—Ann. Mus. Paris, i. (1802) t. 27, f. 1; De Candolle, Strophanthus, t. 1; Gray, Western Africa, t. C (*S. pendulus*); Nouv. Arch. Mus. Paris, 3rd series, v. (1893) t. 16 (*S. Paroissei*); Payrau, Strophanthus, p. 163, tt. [1, f. 4 (trans. sect. of leaf), t. 2, f. 6 (seed, nat. size), t. 5, f. 4 (trans. sect. of seed) *S. Paroissei*] tt. 3, f. 1, t. 6, f. 4; Engl. Monogr. Afr. Pflan. *Strophanthus*, t. 10, f. K (seeds); Pobéguin, Fl. Guin, Franç. t. 32.

Vernac. names.—Lagba Ommode (Yoruba, *Moloney*, *Millson*); Isa-wewe (Ebute Metta, *Millen*, *Dawodu*); Sagere (Lagos, *Millen*); Isha (Oloke-Meji, *Foster*); Kwankwauni (Kontagora, *Dalziel*); Isha Kekere (W. Africa, *Fraser*).

Lagos, Oloke-Meji, Abeokuta, Ebute Metta, Old Calabar, in S. Provinces, Zungeru, Kontagora, Nupe, etc., N. Provinces, Nigeria; known also from Senegambia to the Lower Congo.

Used for arrow-poisoning, Lagos, Oloke-Meji (Foster, No. 161, 1907, Herb. Kew); mixed with "Isa" to form arrow-poison, said not to be poisonous if not mixed. Ebute Metta (Millen, No. 25, 1893, Herb. Kew); more frequently employed in Zungeru and Kontagora as an arrow-poison than *S. hispidus* (Dalziel, Bull. Imp. Inst. 1907, p. 264).

A strong climbing shrub. Found on rocks or on the tallest trees of the ravine, Kontagora (Dalziel, l.c.); climbing to the tops of huge trees in the forest; flowers yellowish-orange striped with purple, flower buds purplish outside, Aburi Hills, Gold Coast (Johnson, Herb. Kew); a shrub in the hedgerows, Kissy, Sierra Leone (Barter, Herb. Kew).

Ref.—*Strophanthus sarmentosus*, in Recherches sur les Strophanthus, Payrau, pp. 85–87, including *S. Paroissei*, pp. 88–91.

The following general references are to the genus:—

Strophanthus, in New Comm. Pl. and Drugs, Christy, No. 10, 1887, pp. 7–29, illustrated.——Recherches sur les Strophanthus, Payrau, pp. 1–176, pl. i.–ix. with 2 maps showing the distribution of the species of *Strophanthus* in Africa and Asia, and

including a bibliography giving nearly 200 references to literature on the subject (Soc. d'Editions Scientifiques, Paris, 1900). ——"*Strophanthus*, Gilg, in Monograph Afrik. Pflanzenfam. und Gattungen, Engler, pp. 1–48, tt. 1–10, 4 figs. in the text (Leipzig, 1903).——Strophanthin: Strophanthina crystallisata, in Merck's Annual Report, xviii. 1904, pp. 177–178.——"The Arrow Poisons of Northern Nigeria," La Chard, in Journal of the African Society, xvii. Oct. 1905, pp. 22–27.——"Welsche Strophanthusart verdient als Offizinell in das neue Arzneibuch aufgenommen zu werden" [Sonder-Abdruck aus den Berichten der Deutschen Pharmazeutischen Gesellschaft (Berlin, 1908)] Gilg, pp. 284–297.——"Semen Strophanthi," in Lehrbuch der Pharmakognosie, Karsten & Oltmanns, pp. 291–293, ff. 443–446 (Jena, 1909).

Beaumontia, Wall.

Beaumontia grandiflora, *Wall.* Tent. Fl. Napal. (1824) p. 15.

An evergreen climber; stem woody, shoots pubescent. Leaves 7–12 in. long, 3–7 in. broad, glabrous above, sometimes tomentose below, ovate oblong, shortly acuminate. Inflorescence a terminal cyme; corolla 3–5 in. long, tubular-campanulate, white or lemon-white. Fruit a double follicle 5–10 in. long; seeds $\frac{3}{4}$ in. long.

Ill.—Roxb. Pl. Corom. t. 281 (*Echites*); Bot. Reg. xi. 1825, t. 911; Wallich, Tent. Fl. Napalensis, Illust. t. 7; Geel. Sert. Bot.; Bot. Mag. t. 3213; Rchb. Exot. iii. t. 172; Paxton, Mag. xiii. p. 103; Gard. Chron. May 8th, 1886, p. 593, f. 129; Ill. Hort. 1887, t. 8; Sem. Hort. 1898, p. 15, f. 199; Journ. Hort. Series 3, xxviii. p. 243; Gard. Chron. Jan. 15th, 1910, p. 43.

Large flowered Beaumontia; Nepal Trumpet Flower.

Native of the Eastern Himalaya, Nepal, etc. Cultivated in the Botanic Gardens, Old Calabar.

A fibre is obtained from the young twigs in India (Dict. Econ. Prod. India).

Produces annually a fine show of flowers if allowed to climb to the top of high trees, Trinidad (Bull. Misc. Inf. Roy. Bot. Gardens, Trinidad, 1906, p. 114). A handsome decorative climber suitable for trellis work.

Funtumia, Stapf.

Funtumia africana, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 190.

Ill.—Hŏok. Ic. Pl. t. 1276 (*Kickxia africana*); Kew Bull. 1895, p. 246 (*K. africana*, fl. branch); Tropenpfl. 1897, pp. 99–103 (*K. africana*, figures of flowers only); Notizbl. Bot. Gart. Berlin, i. 1897, No. 7 (*K. africana*, fl. branch); Revue, Cult. Col. i. 1897, p. 13, f. 1 (fl branch), p. 15, f. 2 (*K. africana*, excl. fruit); Jumelle, Pl. Caoutchouc et a Gutta (1898) p. 69, f. 10 (*K. africana*, fl. only); Morris, Journ. Soc. Arts, xlvi. 1898, p. 776 f. 15 (*K. africana*, fl. branch, from Kew Bull. l.c.); Notizbl. Bot. Gart. Berlin, i. 1899, t. 2 (*K. africana*, fl. only); Schlechter,

Westafr. Kautsch. Exp. p. 238 (*K. africana*); Hook. Ic. Pl. tt. 2696–2697 (*K. africana*, var. *Klainei* and var. *iners*); Holland, Rubber Cult. W. Africa, t. 1; Warburg, Pl. Caoutch. (1902) p. 201 (*K. africana*, fl. only); Jumelle, Pl. Caoutchouc pays chauds (1903), p. 382 (*F. africana*), p. 389 (fr. and seed); Tropenpfl. 1904, p. 233 (*Kickxia africana*); De Wildeman, Mission E. Laurent, ii. t. 169 (follicles); Yves Henry, Caoutchouc Afr. Occid. Franç. p. 203 (branch and fruit); Bull. Agric. Congo Belge, i. 1910, p. 251, t. 85 (Blad van een *Funtumia*: Waarschijmlijk *Funtumia africana*); Christy, African Rubber Industry, p. 76, f. 35, p. 81, f. 36 (habit), 37 (leaves, fl. fr. etc.), p. 85, f. 38 (branch), f. 39 (seeds).

Vernac. names.—Funtum (Gold Coast, *Tudhope*, *Chipp*); Bassa Bassa (Benin, *Christy*, *Unwin*); Sese, Osese (Gold Coast, *Armitage*, *Dudgeon*); Kewattia or Kewatia (Sierra Leone, *Cardew*, *Mann*, *Haydon*); Kamutt, Buboi (Sierra Leone, *Unwin*); Froumodon (Ivory Coast, *Christy*); Pesin, Pri, Manan, Wala (Ivory Coast, *Chevalier*).—Spurious Rubber Tree, Male Funtum.

Widely distributed in West Africa, from Sierra Leone to the Cameroons and the Gabun sometimes with *Funtumia elastica*.

The latex coagulates into a paste-like substance of no commercial value in itself, but used to adulterate the latex of good rubber in S. Nigeria (Col. Rep. Misc. No. 51, 1908, p. 39; Dudgeon, Agric. and For. Prod. W. Afr. p. 99), and on the Gold Coast (Chipp, List of Trees, Gold Coast (1913) p. 27).

The wood is sometimes used for stools, Gold Coast (Chipp, l.c.), of no value for export but useful locally, Gold Coast (Armitage, Bull. Imp. Inst. 1910, p. 238); wood white and soft, used by the natives of the Ivory Coast to make calabashes and plates (Chevalier, Les Vég. Util. l'Afriq. Trop. Franç. v. p. 122); weight 38·5 lb. per cubic ft. according to Bull. Imp. Inst. (l.c.), density 0·488 (Chevalier, l.c.), and a specimen in the Museum at Kew has a specific gravity of 0·401 = 25 lb. per cubic ft.

A tree 15–80 ft. high, trunk up to 10 ft. in circumference (Mann. Mus. Kew); a tree at Itu, Old Calabar River, stood 70–80 ft. high with a circumference near the base of 3 ft. 2 in. (Holland, No. 5, 1897, Herb. Kew). Similar in habit to *F. elastica*, and distinguished by the absence of pits in the axils of the midrib and lateral nerves on the underside of the leaf, the larger yellowish flowers, the long and narrow follicle and cream-coloured floss.

The seeds have been found as an adulterant of official *Strophanthus* seed, *S. Kombe* and *S. hispidus*. Though very similar in general appearance the seeds of *Funtumia* may be readily separated by the spindle shape, absence of hairs and the folded cotyledons, against the flattened, hairy surface and straight cotyledons in *Strophanthus*, and further according to Siedler (Zeitschr. des. Oesterr. Apoth. Ver. xxxv. p. 398; Year Book Pharm. 1897. p. 158) transverse sections of the seeds assume a brown and subsequently a cherry red colour in *Funtumia* and a

green colour in *Strophanthus* on treatment with concentrated sulphuric acid. These particulars may also apply to seeds of *F. elastica.*

Funtumia elastica, *Stapf*; Fl. Trop. Afr. IV. Sect. 1, p. 191.

Ill.—Kew Bull. 1895, p. 244 (*Kickxia africana*, fruit only); Revue Cult. Col. i. 1897, p. 47, f. 2 (*K. africana*, fruit); Tropenpfl. 1897, pp. 99–103 (figures of fruit only); Notizbl. Bot. Gart. Berlin i. 1897, No. 7 (*K. africana*, fruit only); Morris, Journ. Soc. Arts, xlvi. 1898 (*K. africana*, fruit from Kew Bull. l.c.); Jumelle, Pl. Caoutchouc et a Gutta (1898) f. 10 (*K. africana*, fruit only); Notizbl. Bot. Gart. Berlin. ii. 1899, t. 1 (*K. elastica*); Schlechter, Westafr. Kautsch. Exp. p. 99 (*K. elastica*); Hook. Ic. Pl. tt. 2694–2695; Holland, Rubber Cult. W. Africa, t. 2; Warburg, Pl. Caoutchouc (1902), p. 204 (*K. elastica*); Jumelle, Pl. Caoutchouc pays chauds (1903), p. 387, f. 48 (fl. br.), p. 388, f. 49 (fr. and seed); Tropenpfl. 1904, p. 232 (*K. elastica*); Johnson, in Col. Rep. Misc. No. 28, 1905, p. 9 (tree attacked by caterpillars, *Glyphodes ocellata*); Berichte, Land Forstw. Deutsch Ost. Afr. ii. 1905, t. 10 (*Kickxia elastica*); Tropenpfl. 1905, p. 509 (leaf showing pits); De Wildeman, Mission E. Laurent, i. p. 555, f. 126 (follicles), p. 557, ff. 127, 128 (follicles), p. 558, ff. 129, 130 (follicles), p. 560, f. 131 (follicle), p. clxi. (habit, tree 5 years old at Eala); ii. t. 170 (leaf showing pits), t. 171 (fr. br. with leaves), t. 172 (follicles and leaf), tt. 173, 174 (follicles); t. 183 (leaves attacked by coccides); Dawe, Rep. Bot. Miss. Uganda, 1906, t. 5; L'Agric. prat. pays chauds vii. 2, 1907, pp. 5–16; Yves Henry, Caoutchouc, Afr. Occid. Franç. p. 203 (branch and fruit); Ann. Mus. Col. Marseille, vii. 1909, p. 400, f. 5 (plantation); Thompson, Col. Rep. Misc. No. 66, 1910, t. 21; Bull. Agric. Congo Belge, i. 1910, t. 82, t. 83 (Beplanting Coquilhatville Bormen, 4 years); Engl. and Drude, Veg. Erde, ix. p. 637, f. 548; Christy, African Rubber Industry, frontispiece (habit, trees $6\frac{1}{2}$ years old), and numerous illustrations throughout the work, showing habit, seedlings, pods, seeds, and tapping.

Vernac. names.—Ofruntum, Funtum (Gold Coast, *Johnson, Dudgeon, Chipp*); Efunmundone, Puni (Gold Coast, *Chipp*); Ire, Ere or Ireh (Lagos, *Thompson, Moloney, Punch, Olubi*); Iyeri (Benis, *Thompson*); [Anyo (Benin), Buboi (Mendi), Emarr (Timani) *Unwin*]; Gboi-boi (Sierra Leone, *Dudgeon, Smythe*); Namu-Kagu (Uganda, *Dawe*); Efurumunda, Ofuntum, Péchi, Poyadua, etc. (F.W. Africa, *Chevalier*); Eté (Bulu, Cameroons, *Bates*).—West African Tree Rubber, Lagos Silk Rubber, Female Funtum.

Found throughout West Tropical Africa from Sierra Leone to the Cameroons, extending to the Congo region, and B.E. Africa.

The most important source of rubber indigenous to West Africa, including "Lump" rubber from Lagos, Old Calabar, Benin, Cape Coast Castle, Liberia, etc., "Lagos Biscuit" and "Lagos Strip" pressed in Liverpool from "Lagos Lump," "Manoh

Twist" from Sierra Leone, "Manoh Cubes" from the Ivory Coast (Mus. Kew). The value may fluctuate from 1s. 6d. to 2s. or more per lb., with higher prices approximating to those of Para (*Hevea brasiliensis*) for that prepared on plantations. In January 1913 "Lagos Lump" was fetching 1s. 11d. to 2s.; January 1914, 1s. 2½d. to 1s. 3d. and in January 1915, 1s. 3½d. per lb., "Gold Coast Lump" and "Ivory Coast Lump" being approximately the same (Rayner and Co.'s W. C. Afr. Prod. Rep., Nigerian Customs and Trade Journ.). For comparison with these prices in Liverpool it may be noted that the rubber exported from Lagos in January 1914, was valued at 8½d. per lb. (see Nigerian Customs and Trade Journ. Feb. 2nd, 1915—12,571 lb. value £444 for month of January). The local price of "Silk Rubber" in Lagos (1895) was 10d. to 1s. 2d. per lb. (Kew Bull. 1895, p. 246). The lower price of 8½d. may be due to the condition of the market, but more likely to the mixed sorts, the inferior qualities bringing down the average of the superior. These prices are, however, sufficient to indicate the importance in the preparation of official supervision when the price realised for rubber from trees in the Mamu Government Reserves and the Ibadan Native State Reserves (tapped in 1912) sold locally (Jan. 1914) was 3s. 10d. per lb. (3435 lb. at £658 7s. 10d. see Col. Rep. Ann. No. 782, 1914, p. 13) and from plantation grown trees in Benin (tapped 1910), sold in London (March, 1911) from 5s. 6d. to 6s. 6d. per lb. (Thompson and Foster, Rep. Benin City Commercial Pl. 1912, p. 7, about 1000 lb. sold).

It is not possible to give the exact amount of the rubber obtained from this tree, exported from the Colony, but the total amount of rubber exported from Lagos amounted to 25,181 lb. value £950 [= 9·02d. per lb.] in 1914 (Nig. Customs and Trade Journ. Jan. 2, 1915, p. 13) and more than seven times this amount—175,454 lb. value £9811 [=13·4d. per lb.] in 1913 (l.c.) in which year the total imports from the Colony and Protectorate of Southern Nigeria into the United Kingdom amounted to 875,800 lb. value £86,035 [=23·5d. per lb.] (Trade of Unit. Kingdom, i. 1914, p. 185). The rubber would consist principally of that from the species under consideration, *Landolphia owariensis* and *Clitandra elastica* as being all that could be properly classed as rubber but there is no doubt that the extracts from *F. africana*, other *Landolphias*, *Clitandras*, *Carpodinus*, etc., mentioned throughout this order are too often included in the general returns.

The floss from the seed has been found on examination to consist of 14·7 per cent. moisture, 3·7 per cent. ash, and 56·4 per cent. cellulose; reported on as of poor quality and not worth more than 1d. per lb. on the London market (Johnson, Rep. Bot. Gdns. Aburi, 1904, p. 20; Bull. Imp. Inst. v. 1907, p. 121). A sample has been valued (1912) at 4½d. per lb. (Col. Rep. Ann. No. 778, 1913, p. 27). It has been estimated that 88 lb. of fibre might be obtained per acre from six year old trees (Journ. D'Agric. Tropicale, 1912, p. 27), and floss from East Africa it is stated has been submitted to spinning trials which have indicated its suit-

ability for manufacturing (Bull. Imp. Inst. ix. 1911, p. 412). In comparison with "Kapok" (*Eriodendron orientale*) and "Akun" (*Calotropis procera*) see pp. 87 and 463 respectively it is of little value.

The seeds have been found to yield about 26 per cent. of oil suitable for technical purposes, but a bitterness in the residue—not yet understood, makes it uncertain for edible purposes (India Rubber World, xlvi. 1912, p. 475).

The wood is used for purposes similar to those of *F. africana*.

The tree has been cultivated on a large scale in most of the West African Colonies, in Togoland, the Cameroons (about 350,000 trees in 1905—see Tropenpfl. July 1905, p. 385), the Congo (about 3,500,000 trees in 1911—see Cons. Rep. Ann. No. 5043, 1913, p. 20), Uganda, etc., and distributed to Trinidad, Straits Settlements and other tropical countries out of Africa by seeds or plants from the Royal Gardens, Kew. In Nigeria special reserves have been made in various parts including Benin, where the oldest plantations are to be found having been started about 1902; some hundreds of plants in association with Liberian Coffee (see plan p. 29) and to form avenues were planted out during August and September of 1900 at Old Calabar; at Mamu, Oloke-Meji, Ilaro, Oban, Lokoja, Oshun River (see pp. 39–46 of this work). It is reported that by 1908 in the Central Province alone there were 2251 plantations containing 1,125,972 trees (Col. Rep. Ann. No. 630, 1909, p. 15). This would include the Benin District, in reference to which the Governor in his address to the Legislative Council (1909) stated that the large village plantations of *Funtumia elastica* made at the instance of the Forest Officers were coming into bearing and some of them would be tapped in 1910 (S. Nig. Gov. Gaz. 6th Oct. 1909, p. 1380), trees in the Ibadan and Mamu Reserves were being tapped in 1912 (Col. Rep. Ann. No. 782, 1914 (for 1912), p. 13). At the present time it is not uncommon for the Forestry Department to sell 3000 lb. and upwards of rubber from these cultivated trees.

The discovery of the tree and the foundation of the industry in Lagos is fully discussed in Kew Bulletin, 1895, pp. 241–247.

Propagation is readily effected by means of seeds. Cuttings are not usually recommended, though they have been found to grow, rooting in about a month or six weeks. The tree in S. Nigeria flowers about June and the seeds are ready for collecting about January or February. A single follicle contains about 60 seeds, easily detachable from the floss. About 800 seeds go the the ounce. They should be sown as early as possible after collection in shallow well-drained boxes or in nursery beds in light rich soil from an inch to two inches apart, and when about 3 or 4 inches high transplanted into prepared beds and given a foot or so between each plant or put singly into bamboo pots. It is important to keep the plants growing without a check and they will be strong enough about 6 months after sowing for putting out in permanent places,

where from 10 to 15 or 20 feet between each plant will be required, the minimum distance when thinning out is intended and the maximum when it is found advisable to grow intermediate crops such as ground nuts (*Arachis hypogaea*), etc., at least until the trees can be tapped. In any case sufficient room should be given to keep the ground around the trees in good tilth by sowing some leguminous cover crop, for which purpose many suitable plants are described herein (see p. 179, Leguminosae). A little temporary shade may be necessary until the plants are well established, and where large trees have been left for this purpose in cleared ground it seems generally to have been advisable ultimately to cut them out. Planting thickly in the hope of killing out weeds or to encourage straight growth is not advisable, as irrespective of the fungus diseases that so often take first place unless the cultivation is mixed, the tree is particularly noted for the attacks of a caterpillar (*Glyphodes ocellata*) which at times strip off every leaf. Early and careful pruning of the lower branches would tend to secure straight trunks.

Tapping was originally performed by the natives by means of a central groove $\frac{1}{2}$ an inch or so wide with side grooves about the same width 15 in. or so apart running around the tree at an angle of about 45°, the cutting being done by an ordinary gouge chisel such as could be made by the native blacksmiths. The almost complete extinction of the industry because of the injury to the tree by exposing so much of the wood and sometimes by felling the tree will be well remembered, but in the improved methods it has not been possible to depart from the original principle of tapping and it is a modified form of this calculated to get the maximum amount of latex with the minimum amount of injury to the tree, that has since been advised by the Government and made the subject of special regulations, issued by the various Native Councils with the advice and assistance of officers of the Forestry Department (see Rule No. 10 of 1909 "Regulations under the Forestry Ordinance," in Govt. Gaz. S. Nigeria, Oct. 13th, 1909, pp. 1431–1433 and Govt. Gaz. Extraordinary, March 14, 1911, Native Council Rule No. 1 of 1910) to the effect that no tree shall be tapped at a greater height than that of 10 ft. from the ground—which has not a girth of at least 18 in.—except on the full herring-bone system—at a later hour than 8 a.m. and not more than once in every 13 lunar months. Special permits are issued by the Provincial Forestry Officer under whose authority and direction the operations are carried out. In the system advised a channel is cut from the base to the authorised height with side grooves at intervals of not less than 6 in. and not more than $\frac{1}{4}$ in. wide in all cases, special care being taken not to penetrate to the wood or cambium layer, and not more than half the tree tapped at one time. At the second tapping the second half of the tree would be cut and on the same principle the half herring-bone system sometimes advised would cover the whole tree in four years instead of two. In either case sufficient time must elapse to admit of one set of cuts healing before another

set is made. Tapping by means of V-shaped cuts about 2 in. wide and 2 in. apart was for a time recommended as an alternate method (see The Forestry Proclamations, 1901 and 1905, "Rules Relating to Rubber," Rule No. 7 of 1905, in Govt. Gaz. S. Nigeria, Aug. 18, 1905, p. 475, since revoked in Rule No. 10, of 1909, l.c.), but this is better adapted to trees with thicker bark and larger trunks. Cutting to the cambium layer has been called "excision" tapping, but a method known as the "incision" consists of very shallow channels, just deep enough to allow an easy flow of the latex down the tree, incisions being made in the channels by means of a circular pricker. It is claimed for this method that a tree can be tapped three times a year, giving a high yield with comparatively little damage. Another method started on the Belgian Congo (see Proc. 3rd Internat. Congress, Trop. Agric. London, 1914, p. 173) is on the incision principle, but the full herring-bone is not made in one operation, the tapping is completed in 9 or 10 days, a few new laterals being traced every other day. The trees it is said seem to stand this tapping very well, yielding twice the amount collected by the ordinary herring-bone and four times that by means of vertical incisions.

Of the various tapping knives it is difficult for general purposes to get the native away from his original gouge, which given the all important sharp edge and the right dimensions, $\frac{1}{4}$ in. wide and V-shaped, would for convenience to him perhaps be difficult to improve upon; all the patents usually requiring very skilful handling. In some experiments made in Benin (see Foster, Rep. Benin City Communal Plantations, 1910, p. 9) it was found that the "para," the "secure," the "sculfer," the "Christy" [on the incision method] and "Messrs. Walker and Sons" knife, were suitable for *Funtumia*.

For coagulation various methods have been tried and found more or less effective, including chemicals—carbonate of potash and acetic acid, formalin, hydrochloric acid, hydrofluoric acid (Purub), etc.—a hot infusion of the leaves of *Bauhinia reticulata* (see p. 263), the juice of the "Diecha" Vine (*Strophanthus Preussii*, see p. 450), the juice of *Strophanthus Barteri* (see p. 446), by evaporation and absorption, and by boiling. It is not proposed to discuss here the merits of all these methods, but a few particulars of those of native origin may not be out of place. The official regulations mentioned under tapping allow only the biscuit form of prepared rubber, and some very excellent material can be obtained by diluting with water—about equal parts—heating the latex to nearly boiling point, and afterwards kneading and pressing out the coagulum while soft with a roller into biscuits of a convenient size. Lump rubber is usually made by boiling the milk and the difficulty in preparing this clean and dry lies in the large masses being treated at one time, and it is therefore advisable to deal with sufficient only to make the desired size of biscuit. The rubber is finally well washed and dried under cover—the hot sun and excessive light is believed to be the cause of "tackiness." In the Mamu Reserve 10 biscuits have been found to weigh one

pound; the weight is kept fairly constant by diluting the latex before boiling and regulating the amount of diluted latex for each biscuit (Thompson, Rep. on Visit to Mamu Reserve, 1911, p. 2).

Coagulation of the latex by evaporation and absorption was at one time common. A cavity was cut in the trunk of a tree and milk was thrown in daily until it was full; the milk is then covered with palm leaves and kept air-tight, if possible, and in 14 days or a month it becomes solid; in the rainy season it might take two months to solidify. This was known as the "silk rubber" (see Kew Bull. 1895, pp. 243, 245).

Under the heating process which is usually adopted because of the greater convenience, it is recommended to let the fresh latex stand for 12 hours before cooking (Thompson and Foster, Rep. Benin City Communal Pl. 1910, p. 5). In Uganda the milk stands for a couple of days in large earthenware pots before boiling (Kew Bull. 1907, p. 188). Formalin or absolute alcohol have been found effective in coagulating cold *Funtumia* latex, but Purub (a German patent preparation of fluorine) and acetic acid have no effect (see Kew Bull. 1911, p. 126; Ann. Rep. For. and Agric. Depart. Lagos, 1910 (for 1909), p. 7).

There are some very good samples in the Kew Museum made by "boiling" the latex (Gold Coast, 1911), "biscuits" or "sheets" coagulated naturally in a wooden receptacle (Aburi, 1911), "crepe," and "lump" coagulated with the juice of the "Diecha" Vine (*Strophanthus Preussii*) (Evans, Gold Coast, 1909); rubber coagulated by an infusion of the leaves of *Bauhinia reticulata* (Evans, Gold Coast, 1908), with Formol (Gold Coast, 1911) and by double-pot process, afterwards passed through a small hand machine (Evans, Aburi, 1910).

Mixing the rubber with sand, stones, or rubbish of any description, latices of inferior quality, all of which were formerly too common, has been met in Nigeria by the "Adulteration of Produce Ordinance."

The tree is usually tapped in the rainy season about May to October. The yield may vary considerably in each tree according to age, etc., and for each locality, but from 1–4 oz. from trees about 7 years old may be taken as a fair estimate. 10–15 lb. of rubber from a single tree is given at the time the tree was first known (Kew Bull. 1895, p. 242) but as history has proved the trees did not last long at this rate. Some very fair tests have been made (1910) in the Benin City Communal Plantations (see Thompson and Foster, Rep. l.c.) in which the results show an average yield at one tapping of 1·406 oz. per tree [about 8 years old], obtained by tapping 4706 trees, 18 in. in girth and over, to a height of 10 ft., giving a total yield of 413 lb. 12 oz. of dry rubber. A slightly higher yield of 1·59 oz. per tree in the same plantations was obtained in 1911—20,210 trees yielding 1885 lbs. 11 oz. of dry rubber (Col. Rep. Ann. No. 735, 1912, p. 13). The average yield of latex at each tapping is given as about one quart from each tree, which may amount to one pound of rubber per

annum in Uganda (Kew Bull. 1907, p. 188), a tree yields from one small to two double gin flasks of juice, Gold Coast (Armitage, Report Rubber Trees and Vines, Encl. in Letter, Col. Office to Director, Kew, Nov. 30, 1898) and 2468 c.c. of latex, producing 679 grammes of dry rubber, from 10 trees 10 years old with an average girth of 21½ in., equal to 2·39 oz. of rubber per tree, Gold Coast (Rep. Agric. Dept. Aburi, 1912, p. 31); the trees in this instance were tapped eleven times (alternate mornings, excepting Sundays) on the "herring-bone" system to a height of 6 ft. and on two-thirds of the circumference; six side cuts were made at each tapping at 12 in. apart on the right and left side of the channel alternately, subsequent cuts being 2 in. from previous cuts (l.c.). According to the same report a yield of 715 c.c. of latex, equal to about 321 grammes of dry rubber, was obtained from 9 trees having an average girth of 19½ in., tapped on the "vertical-parallel" system. A yield of 4 oz., 2 oz. and 1 oz. has been obtained respectively from one tree 7 years old, 25 ft. in height, 19 in. girth at 3 ft. from the ground, one 9 years old, 26·8 ft. in height, 21 in. girth at 3 ft. from the ground, and another same age and size, all tapped in the month of December, Gold Coast (Johnson, Col. Rep. Misc. No. 28, 1905, p. 8).

Two and a half oz. of rubber in one day have been obtained from trees 5½ years old tapped on the double-herring-bone plan of fifteen cuts each side, in the Cameroons (Tropenpfl. July, 1905, p. 386), where it has been found that one man could collect from 5 trees of the age given, about 400 grammes of rubber per day, at a cost of about 9d. for labour with a return from the rubber in the local market of about 1s. 7d. per lb., and though this would pay, general tapping at this age in order to avoid injury to the trees was not recommended (l.c.). Approximately (2¾ oz.) the same amount per tree has been obtained from trees 8—9 years old on the Belgian Congo where the trees were placed 3 metres apart (10 ft. by 10 ft. = 435 trees per acre) the yield under these conditions being calculated at about 407 lb. of dry rubber per hectare (= about 164 lb. per acre) per year, at a cost for collecting of about 7d. per lb., the value, at the time, of the rubber being about 2s. 2d. per lb. (see Bull. Agric. Congo Belge, v. 1914, pp. 95–104). Other instances might be quoted, but those given indicate sufficiently the returns that may be expected.

Ref.—"New Rubber Industry in Lagos (*Kickxia africana*)," in Kew Bull. 1895, pp. 241–247.——"Le *Kickxia africana* Bth." Lecomte, in Revue des Cult. Col. i. June 1897, pp. 12–19; July 1897, pp. 41–47.——"*Kickxia africana, Bth.* im Deutschen West Afrika," Schumann, in Notizblatt Bot. Gart. Berlin, i. 1897, pp. 217–221.——"*Kickxia africana*," Warburg, in Der Tropenpflanzer, i. 1897, pp. 99–103.——"*Kickxia africana*," in Les Pl. à Caoutchouc et à Gutta, Jumelle, in Annales L'Inst. Col. Marseille, v. 1898, fasc. 1, pp. 68–73.——"Über Westafrikanische Kickxia-Arten," Preuss in Notizblatt Bot. Gart. Berlin, No. 19, July 1899, pp. 353–360.——"Die Überführung der *Kickxia* von

Lagos nach Kamerun," in Der Tropenpflanzer, iii. 1899, pp. 355–361.——Rubber Cultivation in West Africa, Holland, pp. 1–7, pls. i.–v., illustrating the "native," "herring-bone" and "vertical-parallel" systems of tapping (printed by the Crown Agents for the Colonies, 1901).——"The Experimental Cultivation of Castilloa and Funtumia Rubbers in Trinidad," Bull. Imp. Inst. i. 1903, pp. 160–167.——"*Funtumia*," in Les Pl. à Caoutch. et à Gutta Exploitation, Culture et commerce dans tours les pays chauds, Jumelle, pp. 381–392 (Augustin Challamel, Paris, 1903).——"Die *Kickxia elastica*, Preuss. und irhe Kultur," Zitzow, in Der Tropenpflanzer, viii. 1904, pp. 228–250, with plates.——"Vorschläge betreffs der Ausbeutung der Wilden Kickxia-Bestände in Kamerun," Frhr v. Stein, l.c., viii. 1904, pp. 597–611, with illustrations of tapping knives and tapped trunks.——Der Westafricanische Kautschukbaum *Funtumia* (*Kickxia*) *elastica* in Uganda, Moeller, l.c., ix. 1905, pp. 509–511.——"Rules Relating to Rubber," in Govt. Gazette, S. Nigeria (The Forestry Proclamations, 1901 and 1905: R. No. 7 of 1905), Aug. 18th, 1905, pp. 473–480—"On *Kickxia* and *Funtumia*," Stapf in Kew Bull. 1905, pp. 45–59.——"*Funtumia elastica*," in Col. Rep. Misc. No. 28, 1905, "Reports on Rubber in the Gold Coast and Sierra Leone," Johnson and Smythe, pp. 7–18.——"*Funtumia elastica*," in Mission Emile Laurent, De Wildeman, i. pp. 552–561 (Bruxelles, 1905–07).——"Gbogboi Rubber: *Funtumia elastica*," in Bull. Imp. Inst. iv. 1906, pp. 30–31.——"Kickxiaerträge in Kamerun," Soskin, in Der Tropenpflanzer, x. 1906, pp. 32–39.——"Eine neue Anzapfungsmethode für *Kickxia elastica*," Strunk, l.c. x. 1906, pp. 141–149.——"Die *Funtumia* (*Kickxia*) *elastica* in Uganda," Moeller, l.c. x. 1906, pp. 701–706.——"Le rendement des *Kickxia* au Cameroon," E. D. W. in Bull. Soc. Belge d'Études Colon. No. 6, June 1906, pp. 381–386.——"New Rubber Industry in Lagos" (*Kickxia africana*), "On *Kickxia* and *Funtumia*," in Kew Bull. Add. Series vii. 1906, pp. 44–75.——"Un Arbre à Caoutchouc du Congo: La *Funtumia elastica*," Luc, in L'Agric. prat. pays chauds, vii. 2, 1907, pp. 4–15, illustr.——"African Tree Rubber (*Funtumia elastica*)," in Kew Bull. 1907, pp. 187–190.——Results of the Examination of "Ango" and "Benin Lump" Rubber (*Funtumia elastica*) from Southern Nigeria, Dunstan, in S. Nigeria Govt. Gaz. 1st April 1908, Suppl. pp. 3–5.——"Plantations in Reserved Forests, in Col. Rep. Misc. No. 51, 1908, "*Funtumia elastica*," pp. 13–18 and pp. 31–39, Plantations in Mamu, Oloke-Meji, Ilaro Forest Reserves, etc., with cost of clearing, rates of growth, etc.——Über die Kultur und Kautschukgewinnung von *Kickxia elastica*, Kinzebach, in Der Pflanzer Ratgeber fur Tropische Landw. v. Sept. 1909, pp. 129–140; 12th Oct. 1909, pp. 145–168, including references to works of 50 authors.——"*Funtumia elastica* Rubber," in Bull. Imp. Inst. vii. 1909, pp. 255–257.——"Benin Lump Rubber," l.c. pp. 257–258.——"*Funtumia elastica*," in Les Vég. Util de l'Afriq. Trop. Chevalier, v. 1909, pp. 124–143.——Hints on the Cultivation and Preparation of Gold Coast

Rubber, Evans, pp. 1–11, with illust. of tapping knife and trunk showing method of tapping, translated into the Native language by J. S. Martinson (Fr. Reinhardt, Basel, 1909).——"The Coagulation of *Funtumia elastica*," Christy, in The India-Rubber Journal, xxxvii. April 5th, 1909, pp. 400–401; April 19, 1909, pp. 445–446.——"*Funtumia elastica*," in Col. Rep. Misc. No. 58, 1909, p. 115, with analysis of seed floss.——"*Funtumia elastica* ou Ireh," in Bull. Agric. du Congo Belge, i. 1910, pp. 250–252.——"Cultivation of *Funtumia elastica*," in Kew Bull. 1910, pp. 206–208.——"Note sur un Nouveau régime D'Exploitation du *Funtumia*," Farrane, in Journ. D'Agric. Trop. 1910, pp. 204–207.——"Nouvelles Observations sur le Préparation du Caoutchouc *Funtumia elastica* et sur son avenir a la Cote d'Ivoire," Chevalier, in L'Agric. prat. pays chauds, x. 1. 1910, pp. 189–201.——"Rubbers from Sierra Leone," in Bull. Imp. Inst. viii. 1910, *Funtumia elastica*, pp. 16–18.——"*Funtumia* Rubber from West Africa," l.c. pp. 261–263 with analysis.——"La Dichotomie, cause principale de la bifurcation prematurée de la tige du *Funtumia elastica*," Kinds, in Bull. Agric. du Congo Belge, i. 1910, pp. 36–37; ii. 1911, pp. 156–158.——"*Funtumia elastica*," in Culture et Exploitation des Essences Caoutchoutifères au Congo Belge, in Bull. Agric. du Congo Belge, ii. 1911, pp. 492–511, illustrated.——The Rubber Industry of Lagos Province, Olubi, pp. 1–19 (London, 1911).——"Lagos Silk Rubber Tree (*Funtumia elastica*)," in Kew Bull. 1911, pp. 125–126.——Native Council Rules Relating to the Tapping of Rubber, in S. Nigeria Govt. Gaz. Extraordinary, March 14, 1911, pp. 388–514; repetitions for 32 Districts.——The African Rubber Industry and *Funtumia elastica*, Christy, pp. 1–252, illustrated (John Bale, Sons and Daniellsson, Ltd. London, 1911).——"Inspection of Rubber Exported from Lagos," Thompson, (Correspondence with Colonial Secretary, Lagos) in The Lagos Customs and Trade Journal, May 2nd, 1912, pp. 273–274.——Report on the Rubber Tapping in Benin City Communal Plantations 1910, Thompson and Foster, No. 5, 1912, pp. 1–10.——"Culture du *Funtumia elastica* ou Ireh," d'après le système Christy, E. L. in Bull. Agric. du Congo Belge, iii. 1912, pp. 208–213, with figs. 185, 186, 187, illustrating tapping.——"*Funtumia*," in Bull. Agric. du Congo Belge, iii. 1912 (Les Plantations de Caoutchouc de l'Etat au Congo Belge) pp. 414–420, illustrated.——"Funtumia Rubber, *Funtumia elastica*," in Col. Rep. Misc. No. 82, 1912, pp. 313–335.——"Increasing the yield of *Funtumia elastica* or Lagos Silk Rubber," Leplae, in The Rubber Industry: Official Report of the Fourth Inter. Rubber Congress, London, 1914, Torrey and Manders, pp. 317–318.——"Les Rendements de l'*Hevea brasiliensis* et du *Funtumia* au Congo Belge," E. L. in Bull. Agric. Congo Belge, v. 1914, pp. 88–94.——"Note sur des essais de saignées de *Funtumia elastica* effectués à Musa et a Kutu (district des Bangala) Congo Belge," Gisseleire, l.c. pp. 95–104, illustrated.

Alafia, Thouars.

Alafia landolphioides, *K. Schum.*; Fl. Trop. Afr. IV. Sect. 1, p. 197.

Vernac. names.—Ubaniogon (Benin, *Thompson*); Ottafrefredi (Ibo, *Thompson*).

Lagos, Abeokuta, Asaba, in S. Province and Lokoja—Mt. Patti, N. Province, Nigeria; found also on the Gold Coast.

The latex is used for adulterating that of better kinds of rubber (Thompson, Col. Rep. Misc. No. 51, 1908, p. 61).

A large climber, with handsome fragrant flowers.

Alafia sp.

Vernac. name.—Homa funtum (Gold Coast, *Farmar*).

Ogodo, Asaba, S. Province Nigeria (Unwin, Herb. Kew, 1906): Gold Coast (Farmar, No. 552, 1906, Herb. Kew).

Used on the Gold Coast for coagulating rubber (Farmar, l.c.).

ASCLEPIADEAE.

Omphalogonus, Baillon.

Omphalogonus nigritanus, *N. E. Br.* in Kew Bull. 1912, p. 279.

A climbing shrub. Stem glabrous. Leaves opposite, petiolate, glabrous, elliptic ovate or elliptic oblong, obtuse at the apex, cordate or subcordate at the base; $2\frac{1}{4}$–4 in. long, 2–$3\frac{1}{4}$ in. broad. Inflorescence an axillary cyme, few-flowered. Sepals 2 lin. long, somewhat rounded, very obtuse. Corolla rotate, $\frac{3}{4}$–2 in. in diam., 5-lobed to the middle, glabrous and deep red (Poisson) outside, puberulous and violet-brown inside, yellowish at the base of the lobes (Le Testu). *O. calophyllus*, Hua in Bull. Soc. Bot. France, lii. (1905) p. 268; *non* Baillon, Fl. Trop. Afr. iv. Sect. 1, p. 256.

Ill.—Bull. Soc Bot. France, lii. (1905), t. 3 (*O. calophyllus*).

Vernac. names.—Mbwidun bwe or Mbwidi bi (S. Nigeria, *Thomas*).

S. Nigeria—Nofia (Thomas, No. 1011, 1911, Herb. Kew). A specimen without flowers collected in Kontagora (Dalziel, No. 50, 1906, Herb. Kew) may also belong here.

Latex used to adulterate that of good rubber in S. Nigeria (Thompson, Col. Rep. Misc. No. 51, 1908, p. 39, *O. calophyllus*).

Hua (l.c. p. 275) refers to this as yielding caoutchouc in small quantity, Dahomey. A fibre obtained from the stem used for making cordage and fishing nets in Dahomey, where the plant is cultivated in the native compounds of many villages (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 135, *O. calophyllus*).

Ref.—*Omphalogonus calophyllus*, Baillon et *Periploca nigrescens*, Afz., Hua in Bulletin de la Soc. Bot. de France, lii. 1905, pp. 268–275.

Calotropis, R. Br.

Calotropis procera, *Ait.*; Fl. Trop. Afr. IV. Sect. 1, p. 294. *Ill.*—Jacq. Obs. t. 69 (*Asclepias gigantea*); Schneevoogt, Ic. Pl. Rariorum, t. 18 (*Asclepias procera*); Andrews, Rep. iv. t. 271 (*Asclepias gigantea*); Bot. Reg. (1836) t. 1792; Wight, Ic. Pl. Ind. Or. t. 1278; Bot. Mag. t. 6859; Bentl. and Trimen, Med. Pl. t. 176; Engl. and Prantl, Pflan. iv. pt. 2, f. 67 E to G; Engl. and Drude, Veg. Erde, ix. p. 22, f. 16; Volkens, Notizbl. Bot. Gart. Berlin, x. 1910, App. xxii. No. 3, p. 69, f. 32.

Vernac. names.—Bombomu (Lagos, *Dawodu*); Tumfafia, bamambeh (Yola, *Dalziel*); Ashorr or Oshoor (Arabian, *Braddyll, Moloney*); Usher (Kordofan, Sudan, *Muriel, Pyman*); Oshr (Palestine, *Vester & Co.*); Arka (India, *Pyman, Watt*); Akanda (Bengal, *Dymock, Warden & Hooper*); Chuta (Lunyoro, Uganda, *Dawe*); Fouftan (Gambia, *Brown Lester*); Bombardeira (Cape Verde Islands, *Welwitsch*); Fafetone (Senegal, *Chevalier, Sébire*).—Gigantic Swallow Wort, Auricula tree, Arbre à Soie du Senegal (*Pobéguin*).

Katagum (Dalziel, No. 304, 1908, Herb. Kew); Yola; throughout Tropical Africa, and extending to India, etc.

The stems yield a strong fibre, durable under water, used for making fishing nets, halters, lines and ropes. A sample from the Sudan under the name of "Ushar" fibre has been valued (1912) at £24 per ton with Mexican Sisal Hemp at the same price (Bull. Imp. Inst. 1913 p. 206; Bd. of Trade Journ. Sept. 12th, 1912, p. 646; Col. Rep. Ann. No. 778, 1913, p. 25). The floss on the seeds is used for stuffing mattresses; the acrid milky juice is used mixed with salt to remove hair from hides, the root for tooth cleaners and the wood for making charcoal for gunpowder (Bot. Mag. l.c.). The leaves are used in the preparation of "Merissa"—a native beer; the juice is poisonous, often used as an infanticide, Sudan (Pyman, Trans. Soc. Trop. Medicine, viii. p. 190).

Various medicinal uses are attributed to parts of the plant-leaves, Gambia (Brown Lester, Kew Bull. 1891, p. 273) root, and powdered charcoal, French Guinea (Pobéguin, Pl. Med. du Guin. Franç. in L'Agric. prat. pays chauds, xi. part 1, 1911, p. 291). The bark of the root, given in very small doses, is considered a good cure for leprosy in the E. Indies (Archer, Mus. Kew).

The uses generally are much the same as those of *Calotropis gigantea* (see Kew Bull. 1900, pp. 8–12). It is stated (Journ. d'Agric. Trop, 1911, p. 190) that some 8000 bales of "Akund" or "Fafton" fibre are imported annually into Europe.

A shrub, 3–12 ft. high, or small tree. The stems in some instances measure 3 ft. in girth, Bara, Sudan (Muriel, Indian Forester, xxviii. 1902, p. 55). The wood is approximately twice the weight of "Ambatch" (*Herminiera Elaphroxylon*, see p. 199) and suggests similar uses, in addition to that of gunpowder charcoal mentioned above; a specimen in the Kew Museum weighs about 20 lb. per cubic foot.

Easily cultivated from seed; the fruit in Cape Verde ripens about January (Hiern, l.c.).

Ref.—"*Calotropis*," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 33–49.——"*Calotropis procera*," in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 428–437 (Kegan Paul, Trench and Trübner, London, 1891).——Madar (*Calotropis gigantea*), in Kew Bull. 1900, pp. 8–12, with plate [this reference is given because the practical uses of the two species are the same].——"*Calotropis*," in Manual of Indian Timbers, Gamble, p. 491.——"*Calotropis gigantea* and *C. procera*," in Comm. Prod. India, Watt, pp. 205–208.——"Les *Calotropis*," Berteau, in L'Agric. prat. pays chauds, xii. 2, 1912, pp. 63–73.——"The Fibre of *Calotropis procera*," in Bull. Imp. Inst. xi. 1913, pp. 204–206, with analysis.

Xysmalobium, R. Br.

Xysmalobium Heudelotianum, *Decne.*; Fl. Trop. Afr. IV. Sect. 1, p. 304.

Vernac. name.—Yahhop (Senegambia, *Moloney*).

Borgu, Nupe, Kontagora.

The turnip-like root is eaten by the natives in Senegambia (Moloney, For. W. Africa, p. 385).

A herbaceous plant; found in dry places after burning, Kontagora (Dalziel, Herb. Kew).

Asclepias, Linn.

Asclepias curassavica, *Linn.*; Fl. Trop. Afr. IV. Sect. 1, p. 328.

Ill.—Sloane, Hist. Jamaica, i. t. 129, f. 45 (*Apocynum erectum*); Dillenius, Hort. Eltham. t. 30 (*Apocynum radice*, etc.); Jacquin, Misc. Austriaca, i. t. 2, f. 2; Bot. Reg. (1815) t. 81; Lodd. Bot. Cab. t. 349; Desc. Ant. ii. t. 116; Queensland Agric. Journ. iii. 1898, t. 67; Bailey, Pois. Pl. p. 105, f. 184.

Vernac. names.—Cancerilla (Cent. America, *Dathan St. Cyr*); Chilpati (Indian, *Bailey*); Chilpati (Mexico, *Manning*), Codio (French Guiana, *Heckel*); Algodoncillo, Platanillo (Porto Rico, *Cook* and *Collins*).—Wild Negro or Bastard Ipecacuanha, Red Head, Milky Cotton Bush, Bloodflower, Curassavian Swallow-Wort.

Old Calabar. A native of Tropical America and widely distributed in the tropics.

The root is used in India and the West Indies as an emetic, somewhat the same medicinal value being attributed to it as to the true Ipecacuanha (*Psychotria Ipecacuanha*) though more strongly purgative. The powdered leaves and flower heads have been recommended for dressing wounds and sores, Trinidad, and said to be quite equal to "Capuchin" powder or "Calomel" for the purpose (Bull. Bot. Dept. Trinidad, ii. 1895, p. 70). Recommended in the treatment of phthisis, Hayti (Dathan St. Cyr, in Pharm. Journ. [iv.] xviii. p. 714). Rough brooms of the plant

are used in Mexico to sweep floors and walls of huts to drive off insects and vermin (Kew Bull. 1897, p. 338).

An ornamental plant easily grown from seed: height about 2 ft.; has been cultivated in English gardens since 1692.

Ref.—"*Asclepias curassavica* as an Insectifuge," in Kew Bull. 1897, p. 338.——"Red-Head or Milky Cotton Bush (*Asclepias curassavica*)," Bailey, in Queensland Agric. Journ. iii. 1898, p. 437, "The Wild Ipecacuanha," in The Chemist and Druggist, 1910, p. 733, and in The Agric. News, Barbados, Feb. 5th, 1910, p. 38.

Asclepias lineolata, *Schlechter*; Fl. Trop. Afr. IV. Sect. 1, p. 322.

Nupe, Zungeru, Ilorin, and widely distributed in Tropical Africa.

The roots are used as a stomachic, Shire (Kirk, Herb. Kew).

A herbaceous plant with fleshy fusiform roots; 4 ft. high, Nupe (Barter, Herb. Kew); common in the bush, Zungeru (Dalziel, Herb. Kew), Unyoro, 3900 ft. (Brown, Herb. Kew).

The genus *Asclepias* is a large one and perhaps the most important species in Tropical Africa—not known from Nigeria—are (1) *semilunata*, N. E. Br. Fl. Trop. Afr. l.c. p. 327, the "Kafumba" or "Bugumbo" of Uganda which yields a valuable bast fibre and a floss from the seeds of good value (see Col. Rep. Misc. No. 58, 1909, pp. 74–76; No. 64, 1909, p. 10; Bull. Imp. Inst. iii. 1905, pp. 316–318; vi. 1908, pp. 85–86), (2) *physocarpa*, Schlechter, Fl. Trop. Afr. l.c. p. 328), of British East Africa, and extending to S. Africa; yields a useful bast fibre, plant 2–6 ft. high. Both these are capable of ready increase by cultivation.

Gymnema, R. Br.

Gymnema sylvestre, *R. Br.*; Fl. Trop. Afr. IV. Sect. 1, p. 413.

Ill. Wildenow, Phytogr. t. 5, f. 3 (*Periploca sylvestris*); Ann. Sc. Nat. Paris, Series 2, ix. t. 11, f. A (*G. rufescens* and *G. subvolubile*); Wight, Ic. Pl. Ind. Or. ii. t. 349; Engl. and Prantl. Pflan. iv. pt. 2, f. 85 F–G.

Vernac. name.—Kavali (India, *Watt*).

Lagos, Katagum, and widely distributed in West Africa from Senegal to the Cameroons, throughout tropical Africa, extending to S. Africa, Madagascar and India.

The leaves when chewed neutralise the taste of sweetness (Proc. Linn. Soc. i. 1849, p. 353; Nature, xxxv. 1887, p. 566; Dict. Econ. Prod. India; Dymock, *seq.*). The root applied as a powder to the part bitten and given as a decoction internally, is a reputed Hindu remedy for snake bite, and various medicinal uses are attributed to the plant in India (Watt, Dymock, etc., *seq.*).

A climbing plant, common in the bush, Katagum (Dalziel, Herb. Kew), Lagos (MacGregor, Dawodu, l.c.) a creeper by forest road, Lagos (Millen, l.c.).

Ref.—" An Examination of the Leaves of *Gymnema sylvestre*," Hooper, in Nature, xxxv. 1887, pp. 565–567.——" *Gymnema sylvestre*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 189–190.——" *Gymnema sylvestre*," in Pharmacog. Indica, Dymock, Warden and Hooper, ii. (1891) pp. 450–455, with analysis of the sun-dried and powdered leaves.

Pergularia, Linn.

Pergularia africana, *N. E. Br.*; Fl. Trop. Afr. IV. Sect. 1, p. 426.

West Africa from Sierra Leone to Old Calabar, extending to Mozambique District and Natal.

Extract like Dragon's blood with which the Dragon's blood of commerce is adulterated (Moloney, For. W. Africa, p. 306).

A slender climbing plant.

Leptadenia, R. Br.

Leptadenia lancifolia, *Decne.*; Fl. Trop. Afr. IV. Sect. 1, p. 430.

Ill.—Engl. and Prantl, Pflanz. iv. pt. 2, f. 79, E-F (*L. hastata*).

Vernac. names.—Isanaje igbo (Lagos, *Millson*); Yadia (Katagum, *Dalziel*).

Senegambia to Lagos through Nigeria to Bornu and in the Nile region.—Kordofan, Fashoda, Madi, Gondokoro, etc.

Leaves edible, Katagum (Dalziel, Herb. Kew).

Found as a twiner on rocks, Oyo, Yoruba (Barter, Herb. Kew), on bushes, Bure, near Lake Chad (Elliott, Herb. Kew).

Ref.—" Marakh Twigs, *Leptadenia* sp." in Col. Rep. Misc. No. 58, 1909, pp. 128–129, would probably apply here as a fibre plant.

Caralluma, R. Br.

Caralluma Dalzielii, *N. E. Br.* in Kew Bull. 1912, p. 280.

A succulent herb, 6–18 in. high, stems leafless, branching from the base, erect, tetragonous. Flowers in pendulous fascicles, the axillary fascicles 2–3 flowered; pedicels 1–1½ lin. long, recurved, glabrous. Sepals 1 lin. long, subulate, acute glabrous; corolla nearly ½ in. in diam. 5 lobed, tube about 1 lin. long.

Vernac. name.—Karan Masallachi (Katagum, *Dalziel*).

Katagum (Dalziel, No. 317, Herb. Kew); Sokoto.

Found on rocky hills at Sokoto, sometimes planted near houses, (Kew Bull. l.c.). Chevalier (Bull. Soc. Nat. d'Accl. France, 1912, p. 135) mentions an allied plant, *Caralluma Decaisneana*, N. E. Br., common in the dry zone of Senegal and the Nigerian Sudan which like many fleshy plants are considered " fétiche " by the natives, and that he has seen this one planted in the corner of a field of millet, in the region of Djougou, Upper Dahomey, to keep off evil spirits.

LOGANIACEAE.

Strychnos, Linn.

Strychnos Nux-vomica, *Linn.* Sp. Pl. (1753), p. 189.

A medium-sized deciduous tree. Leaves broadly elliptic 3–6 in. long with petioles about $\frac{1}{2}$ in. long. Inflorescence a lax terminal cyme; flowers greenish-white. Fruit a berry, hard though comparatively thin shell, $1\frac{1}{2}$–2 in. in diam., smooth, shining, colour of an orange when fresh. Seeds several, flat, circular, about $\frac{1}{2}$–1 in. across, $\frac{1}{8}$ in. thick, slightly concave on one side, slightly convex on the other, grey, greyish-white or yellowish-white.

Ill.—Plenck. Ic. t. 117; Gaertner, Fruct. Sem. Pl. ii. t. 179 (seeds); Lam. Encycl. t. 119; Roxburgh, Pl. Corom. t. 4; Hayne, Darst. Beschr. Gewächse, i. t. 17; Nees von Esenbeck, Plant. Medic. Düsseld. t. 209; Woodville, Med. Bot. ii. (1832), t. 79; Guimpel, Abbild. Beschr. t. 136; Stephenson & Churchill, Med. Bot. t. 52; Wight. Ic. Pl. Ind. Or. ii. t. 434 (*S. colubrina*); Burnett, Pl. Util. ii. t. 59a; Spach, Suites (Hist. Nat. des Végétaux), t. 114, f. 1; Schnizlein, Ic. t. 131, ff. 21–23 (seed); Griffith, Ic. Pl. Asiatic, ii. t. 411; Bureau, Loganiaceae, p. 41, ff. 3–8; Bedd. Fl. Sylv. ii. t. 243; Bentl. and Trimen, t. 178; Köhler, Med. Pflan.; Zippel, Ausl. Handels. Nährpfl. t. 25; Journ. Bombay, N. H. Soc. viii. (1893), t. 1; Talbot, For. Fl. Bombay, ii. p. 266.

Vernac. names.—Marathi, Khabaung or Khaboung (Bombay *Kirtikar*; Burma, *Watt, Brandis*); Kuchila (Bengal, *Bentley & Trimen*).—Nux-Vomica, Poison Nut, Strychnine Tree, Crow's Eyes, Snakewood, Dog-buttons, Quaker-buttons, False Angostura Bark.

Native of Cochin China and the Coast of Coromandel. Found in Ceylon, Burma, Java, etc.

The seeds are the source of the poisonous alkaloids Strychnine and Brucine—a tonic medicine in small doses; the extract or tincture being used medicinally.

The wood is used in Burma for carts, agricultural implements and cabinet work; weight 49–65 lb. per cubic foot (Gamble, Man. Ind. Timb. p. 498). Used in India for the cure of snake-bites and in cases of intermittent fever. A decoction of the leaves is used externally in rheumatism.

The bark possesses somewhat similar properties to the seeds, though not so pronounced (Treas. of Bot.), and both are used medicinally in India (Watt, Comm. Prod. India, p. 1052).

The pulp of the fruit is not poisonous and is eaten by birds.

A deciduous tree, propagated by seeds, grows freely in Botanic Gardens, Old Calabar. The seeds for the market only require to be washed out from the ripe fruits and dried in the sun; they fetch in London from about 7s.–10s. per cwt., though in April, 1915, they were quoted at the high price of 16s. per cwt.

Ref.—"Nux Vomica," in Pharmacographia Indica, Flückiger and Hanbury, pp. 428–431.——"*Strychnos Nux-Vomica*," in Med. Pl. Bentley and Trimen, No. 178, 6 pages.——"*Strychnos Nux-Vomica*," in Pharmacographia Indica, Dymock, Warden, and Hooper, ii. pp. 458–500 (Kegan Paul, Trench, etc., London, 1891).——"*Strychnos Nux-Vomica*," in Med. Pflanzen. Köhler, $3\frac{1}{2}$ pages.——"*Strychnos Nux-Vomica*," in Dict. Econ. Prod. India, Watt. vi. 1893, part 3, B. pp. 379–382.——"*Strychnos Nux-Vomica*," in "The Poisonous Plants of Bombay," Kirtikar, in Journ. Bombay Nat. Hist. Soc. viii. 1893, pp. 331–334.——"Noix Vomique," in Les Drogues Simples d'origine végétale, i. pp. 656–659.——"*Strychnos Nux-Vomica*," in Manual of Indian Timbers, Gamble, pp. 497–498.——"Nux Vomica," in The National Standard Dispensatory, Hare, Caspari and Rusby, pp. 1000–1005.——"*Strychnos Nux-Vomica*," in Comm. Prod. India, Watt, pp. 1051–1052.

Strychnos spinosa, *Lam.*; Fl. Trop. Afr. IV. Sect. 1, p. 536.

Ill.—Sim, For. Fl. Cape Colony, t. 111; Journ. New York Bot. Gdn. 1912, p. 127.

Vernac. names.—Mumoovinge (Nupe, *Barter*); Gumdingula (Foulah, *Barter*); Um-Hlala (Kafir, *Sim*); Missalo, Ramba or Muramba (Port. E. Afr. *Sim*); Voavotaka (Madagascar, *Parker, Moloney*); Mohulu hulu (Zambesi, *Kirk*); Litongo (E. Africa, *Christy*); Maboca (Loanda, *Welwitsch*); Mutamba (Chindao, Gazaland, *Swynnerton*).—Kaffir orange.

Lagos, Nupe, and widely distributed in Tropical Africa, extending to S. Africa, Madagascar and Seychelles.

Fruit orange-like, 2–3 in. in diam., shell hard with numerous seeds; acid pulp wholesome and agreeable to eat (Barter, Kirk, Herb. Kew; Hiern, Cat. Welw. Afr. Pl. iii. p. 702), though according to Sim (For. Fl. Cape Colony, p. 274) the natives only eat it when food is scarce.

The seeds are not bitter and samples from the Seychelles have been found to contain no strychnine or any other alkaloid (Col. Rep. Ann. No. 601, 1909, p. 44; Bull. Imp. Inst. 1915, p. 52).

Wood soft, 35–40 lb. per cubic foot, suitable for boxes and other temporary work, Cape, Port. E. Africa (Sim. For. Fl. Cape Col. p. 274; For. Fl. and For. Res. Port. E. Afr. p. 115).

Found as a small tree, 10 ft., everywhere common in Nupe (Barter, Herb. Kew); a small tree 5–8 ft. high with trunk 4 in. in diam. chiefly in thin groves of *Adansonia* and bushy hilly places; in flower from middle of April to middle of May, Loanda (Hiern, Cat. Welw. Afr. Pl. iii. p. 702).

Var. **pubescens,** *Baker,* Fl. Trop. Afr. l.c. p. 537.

Vernac. names.—Munvuvoye (Nupe, *Barter*); Kokiya (Katagum, *Dalziel*).

Katagum (Dalziel, Nos. 373, 721, Herb. Kew); Abinsi, River Benue (Dalziel, No. 924, Herb. Kew), Nupe (Barter, No. 1705, Herb. Kew).

Fruit edible (Dalziel, l.c.)

A shrub or small tree.

ANTHOCLEISTA, Afzel.

Anthocleista nobilis, *G. Don*; Fl. Trop. Afr. IV. Sect. 1, pp. 538, 625.

Ill.—Hook. Ic. t. 793-794 (*A. Vogelii*); Niger Flora, tt. 43-44 (*A. Vogelii*).

Vernac. name.—Apa oro (Lagos, *Dawodu*).

Senegal to the Cameroons, Lower Guinea, etc.

The hollow stems are used as quivers for small poisoned arrows, Niger (Barter, Mus. Kew; Moloney, For. W. Afr. p. 387).

An erect tree 50–60 ft. high.

SPIGELIA, Linn.

Spigelia Anthelmia, *Linn.*; Sp. Pl. (1753), p. 149.

An annual plant, about a foot high. Leaves ovate, sessile, opposite in pairs widely separated. Inflorescence a terminal triplicate or unilateral spike; flowers purplish. Capsule small, muricate.

Ill.—Linne, Amoenitates, Acad. v. t. 2; Lam. Encycl. t. 107; Plenck, Ic. t. 88; Browne, Jamaica, t. 37, f. 3; Desc. Ant. i. t. 61; Tussac, Ant. iv. t. 8; Bot. Mag. t. 2359; Nees von Esenbeck, Plant. Medic. Düsseld. t. 205.

Vernac. names.—Aparan (Oloke-Meji, *Dodd*); Ewe Aran (Lagos, *Dawodu*); Brainvillière (Antilles, *Tussac*).—Worm Grass, Indian Pink, Poudreaux vers ou Brainvilliers (*Descourtilez*).

Oloke-Meji (Dodd, No. 432, Herb. Kew); Lagos (Dawodu, No. 31, Herb. Kew); native of S. America, and found in Florida and the West Indies.

Roots and leaves anthelmintic; leaves used medicinally, Oloke-Meji (Dodd, l.c.), herb boiled for worms, Lagos (Dawodu, l.c.). When eaten by cattle, sheep and goats the plant causes death in from 2–3 hours (Scrutton and Co. Mus. Kew).

BORAGINACEAE.

CORDIA, Linn.

Cordia abyssinica, *R. Br.*; Fl. Trop. Afr. IV. Sect. 2, p. 8.

Ill.—Transv. Agric. Journ. v. t. 170; Agric. Col. 1911, Suppl. p. 93.

Vernac. names.—Alleluba (Katagum, *Dalziel*); Inderab or Inderab invaiya (Arabic, *Muriel*); Banjam (Hameg, *Muriel*); Nabukwi (Zomba, *Purves*); M'tadola (Transvaal, *Burtt-Davy*); Mukebu (Baganda, *Dawe*); Mutumba (Banyoro, *Dawe*).

Katagum, and found also in East Africa.

Fruits edible, made into sweetmeats, Katagum (Dalziel, Herb. Kew).

Wood good (Muriel, Herb. Kew), a useful timber in demand for cabinet work at Kampala, Uganda (Dawe, Herb. Kew), though reported as of no value for export (Bull. Imp. Inst. v. 1908, p. 233), and a valuable timber tree of the Eastern Middle Veld, Transvaal (Burtt-Davy, Transv. Agric. Journ. v. 1907, p. 423); weight of a specimen from Uganda 69 lb. per cubic foot (Bull. Imp. Inst. l.c.).

Found as a medium sized tree 30–40 ft., Zomba (Purves, Herb. Kew), usually grown in open ravines or on outskirts of forest, about 5000 ft., Uganda (Dawe, Herb. Kew).

It forms with *Erythrina tomentosa* the chief vegetation between 4000 6000 ft. in the ascent of Mt. Ruwenzori (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 16).

Cordia Irvingii, *Baker;* Fl. Trop. Afr. IV. Sect. 2, p. 12.

Vernac. names.—Omowewe (Lagos, *MacGregor, Dawodu*); Kymibua or Kyinibua (Gold Coast, *Johnson*).

Wood very durable, used for making shingles, Gold Coast (Thompson, Col. Rep. Misc. No. 66, 1910, p. 84). A specimen from the Gold Coast is described as about as hard and cutting up with the same ease as Beech, excellent lustre though plain, turns well, but not recommended for export; weight about 30 lb. per cubic foot (Stone, Rep. Mus. Kew). A specimen in the Museum at Kew has sp. gr. 0·5 = 31·25 lb. per cubic foot.

A fine spreading tree planted for its shade, in Yoruba towns (Barter, Herb. Kew); 60 ft. high, Gold Coast (Johnson, Herb. Kew); Chipp, List of Trees, Gold Coast (1913, p. 28); may be propagated by its fruits which closely resemble acorns.

Cordia Milleni, *Baker;* Fl. Trop. Afr. IV. Sect. 2, p. 11.

Vernac. names.—Omon (Lagos, *Millen*); Omo or Ommo (Lagos, *McNair, Dawodu, Olubi*).

Lagos (Millen, No. 12, 1893, Herb. Kew); Ibadan Forest Reserve (Punch No. 102, 1901, Herb. Kew).

Leaves used in Yoruba as wrappers for agidi (McNair, Rep. Bot. St. Lagos, March, 1890, p. 333).

Wood close grained suitable for joiners' or cabinet-makers' work (Punch, l.c.) said to resist the white ant (McNair, l.c., Millen, l.c.).

A large tree of spreading habit, of the inland forests, Lagos.

Cordia Myxa *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 14.

Ill.—Rumpf. Amb. iii. t. 97; Plenck, Ic. t. 116; Lam. Encycl. t. 96 (*C. africana, C. officinalis*); Jacq. Fragm. Bot. t. 103, f. 3; Delile, Egypte, t. 19, ff. 1, 2; Hayne, Darst. Beschr. Gewächse, ix. t. 33; Wight, Illust. t. 169; Vidal, Fl. For. Filip. t. 70 D; Ann. Inst. Col. Marseille, 1902, t. 3.

Vernac. names.—Po-tzu (Formosa, *Henry*); Tingué or Toungué (F.W. Afr. *Chevalier*); Lasora, Laswara, Lesuri or Lasséri, etc. (India, *Gamble, Brandis*); Thanat, Toung Thanat

(Burma, *Gamble, Brandis*); Loloopatla (Ceylon, *Thwaites*); Dibg (Arabic, Jericho, *Vester & Co.*).—Sebesten.

East Africa—Portuguese; B. Cent. Africa, Nyasaland, Egypt, Trop. Asia, Madagascar, French Sudan—Upper Niger.

Extract from fruits believed to be used in the manufacture of non-puncturable motor tyres (Mus. Kew).

Fruit eaten with "Soy" (*Glycine Soja*, see p. 211) and "Garlic" by the natives, Formosa (Kew Bull. 1896, p. 70); the viscid pulp is used as birdlime, the kernel is eaten and may be used for marking linen (Gamble, Man. Ind. Timb. p. 501; Dict. Econ. Prod. India).

The leaves are used in asthma and in cases of severe colds and coughs to ease the tightness of the chest (Handbook. Ceylon Court, Col. and Ind. Exhib. London, 1886, p. 51); as plates and in Pegu to cover Burmese cheroots. The bark is used for making cordage in French Guinea and the Nigerian Sudan (Chevalier, *seq.*), made into ropes and the fibre is used for caulking boats in India (Gamble, l.c.) and as a mild tonic, E. Indies (Archer, Mus. Kew).

The wood is comparatively soft, though fairly strong; used in India for boat building, gun-stocks, implements, canoes and for fuel; weight 28–42 lb. per cubic foot (Gamble, l.c.).

A deciduous tree, may be propagated by seed and grows quickly. Cultivated in Lagos and according to Chevalier (Bull. Soc. Nat. d'Eccl. France, 1912, p. 135) it is naturalised in many villages of French Guinea and the Nigerian Sudan.

Ref.—"*Cordia Myxa*, The Sebesten Fruit," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 563–565.—"*Cordia Myxa*," in Manual of Indian Timbers, Gamble, pp. 500–501.

Cordia platythyrsa, *Baker*; Fl. Trop. Afr. IV. Sect. 2, p. 12.

Lagos, Abeokuta, Cameroons, Sierra Leone in Upper Guinea and in the Gaboon, Lower Guinea.

Wood used to make tomtoms or native drums (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 135).

A tree 30–80 ft. high, commonly planted in the villages of the Ivory Coast and other parts of Upper Guinea as a "palaver tree" (Chevalier, l.c.).

Cordia Rothii, *Roem. & Schultes*; Fl. Trop. Afr. IV. Sect. 2, p. 18.

Ill.—Wight, Ic. Pl. Ind. Or. iv. t. 1379; Peters, Mozamb. t. 43 (*C. quercifolia*); Brandis, Ind. Trees, p. 480.

Vernac. names.—Liár (Sind, *Brandis*), Gondi or Gundi (India, *Brandis, Gamble*).

Yo, North Bornu, and widely distributed in Tropical Africa, extending to Arabia and India.

Fruit pulp edible; pickled in India.

The bark possesses astringent properties and a decoction is used as a gargle; the fibre is made into ropes. The wood weighs 42–52 lb. per cubic foot; used for fuel, building and agricultural

implements in India (Gamble, Man. Ind. Timb. p. 501; Dict. Econ. Prod. India).

A shrub or tree up to 16 ft. high; found as a low bush in Bornu (Elliott, No. 149, 1904, Herb. Kew); propagated by seed, suitable for cultivation in comparatively dry regions.

Heliotropium, Linn.

Heliotropium indicum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 32.

Ill.—Pal. de Beauv. Fl. Oware, Benin, ii. t. 96 (*H. anisophyllum*); Bot. Mag. t. 1837; Desc. Ant. vii. t. 483; Wight, Illust. t. 171 (*Tiaridium indicum*).

Vernac. names.—Ogbwe Akukaw (Yoruba, *Millson*); Agogo Igun (Oloke-Meji, *Dodd*); Agogo Igun (Lagos, *MacGregor, Dawodu*); Cay-boi-boi (Cochin China, *Dymock*); Booroondi (Bombay, *Dymock*); Cock's Comb (Gambia, *Brown Lester*); Crête-coq (French Guiana, *Heckel*).—Indian Turnsole or Heliotrope.

Lagos, Nupe, Lokoja, Okuni, Katagum, Bornu, and widely distributed throughout Tropical Africa.

Leaves used medicinally in "Agbo," Lagos (Dawodu, Herb. Kew) are desiccative, resolutive and detersive (Desc. Ant. vii. p. 137); an infusion used in gonorrhoea, Gambia (Kew Bull. 1891, p. 273) and for erysipelas, West Africa (Journ. Soc. Arts, xxxv. 1887, p. 995). An infusion of the flowers used for various medicinal purposes in French Guiana (Heckel, Les Pl. Med. et Toxiq. Guy. Franç. in Ann. L'Inst. Col. Marseille, iv. 1897, p. 116). The plant has a foetid odour like stramonium, taste a little bitter; used as a local application for boils, sores and stings, Bombay (Dymock, Mus. Kew), and various medicinal uses are attributed to the plant in India (Dict. Econ. Prod. India; Pharmacog. Indica, Dymock, ii. p. 525).

An annual plant, $1\frac{1}{2}$–3 ft.; a common weed, with handsome light blue flowers; luxuriating in hot dry and also damp places, plentiful everywhere by streets, houses, etc. flowering nearly the whole year, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iii. p. 719).

Heliotropium undulatum, *Vahl*; Fl. Trop. Afr. IV. Sect. 2, p. 37.

Ill.—Desfontaines, Fl. Atlant. i. t. 41 (*H. crispum*); Lehmann, Ic. Rar. Pl. Asper. t. 40.

Generally distributed, extending to Tropical Asia.

Given as a remedy for snake-bite (Dict. Ec. Prod. India; Moloney, For. W. Afr. p. 388) for which purpose it is administered both internally and applied externally to the wound sometimes mixed with tobacco oil (l.c.).

A perennial plant. In sandy places, St. Vincent Island, Cape Verde (Hiern, Cat. Welw. Afr. Pl. iii. p. 718.)

Trichodesma, R. Br.

Trichodesma africanum, *R. Br.*; Fl. Trop. Afr. IV. Sect. 2, p. 48.

Vernac. name.—Paburpani, or Pabarpani (Punjab and Sind, *Watt, Dymock*).

Kontagora, Bornu, and generally in Africa and India.

The leaves are used in India as a diuretic (Dict. Econ. Prod. India; Moloney, For. W. Afr. p. 389).

An annual plant, common in waste places and cultivated ground.

ARNEBIA, Forsk.

Arnebia hispidissima, *DC.*; Fl. Trop. Afr. IV. Sect. 2, p. 56.

Ill.—Lehmann, Ic. Rar. Pl. Asper. t. 39 (*Lithospermum hispidissimum*); Wight, Ic. Pl. Ind. Or. iv. t. 1393; Jaubert et Spach, Illust. Pl. Orient. t. 363.

Vernac. name.—Jinin-mutum (Katagum, *Dalziel*).

Katagum, Bornu, in Nigeria; Kordofan and other parts of Egypt and extending to North India.

Root deep red in colour giving the native name "man's blood," (Dalziel, Herb. Kew). The scaly bark of the root stock of *Arnebia tibetana* is employed as a dye in Ladak, Kashmir, and another species is used as a substitute for Alkanet (*Alkanna tinctoria*) in India (Dict. Econ. Prod. India; Dymock, Warden and Hooper, Pharmacog. Indica, ii. p. 524).

An annual plant, common on sandy soil, growing very bushy, Kordofan (Muriel, Herb. Kew).

CONVOLVULACEAE.

EVOLVULUS, Linn.

Evolvulus alsinoides, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 67.

Ill.—Rheede Hort. Mal. xi. t. 64; Burmann, Thes. Zeylan. t. 9; Wight, Illus. t. 168 bis, f. 10.

Vernac. names.—Vishnukránta, Vistnukrandi, Shan-kaveli, Nila-pushpa (India, *Dymock, Watt*); Vahimpasika (Madagascar, *Heckel*).

Lagos, Katagum, Nupe, Bornu; and widely distributed in the Tropics.

The plant which is fragrant, is burnt to perfume houses; it is sold in the native markets near the confluence of the Niger and the Benue (Barter, Mus. Kew); the leaves, stalks and roots are used medicinally in India (Dict. Econ. Prod. India: Dymock, Warden and Hooper, Pharmacogr. Indica, ii. p. 543); the leaves are made into cigarettes and smoked in cases of chronic bronchitis and asthma (l.c.), used as a remedy for diarrhœa in Madagascar (Heckel, Ann. L'Inst. Col. Marseille, i. 1903, p. 166).

A common or perennial weed of variable habit, found in very different situations—veldt, fields, plains, hills, etc.

CALONYCTION, Choisy.

Calonyction muricatum, *G. Don*; Fl. Trop. Afr. IV. Sect. 2, p. 118.

Ill.—Jacq. Hort. Schoenbr. iii. t. 323 (*Ipomoea muricata*).

Lagos, Sokoto, Gambia, Sierra Leone, and widely distributed in Tropical Africa, Asia and America.

A perennial climber, common on fences in Sokoto town (Dalziel, No. 372, 1911, Herb. Kew), cultivated at Khartoum (Schweinfurth, Herb. Kew).

Calonyction speciosum, *Choisy*; Fl. Trop. Afr. IV. Sect. 2, p. 117.

Ill.—Bot. Mag. t. 752 (*Ipomoea Bona-nox*); Choisy, Mem. Soc. Phys. Genève, vi. t. 1, f. 4; Wight, Ic. Pl. Ind. Or. iv. t. 1361; Bot. Centralb. lix. 1894, t. 2.

Vernac. names.—Bokboi (Sierra Leone, *Scott Elliot*).—Prickly Ipomoea, Moon Flower.

Tropical Africa and widely distributed in the Tropics.

Used as a vegetable, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 42), and as a remedy for snake-bite, India (Dict. Econ. Prod. India; Dymock, Pharmacogr. Indica, ii. p. 541, *Ipomoea bona-nox*).

A decorative climber 10 ft. and upwards, commonly cultivated, Sierra Leone (Scott Elliot, Herb. Kew). Introduced into gardens of England in 1773.

Quamoclit, Tournef.

Quamoclit coccinea, *Moench*; Fl. Trop. Afr. IV. Sect. 2, 128.

Native of Tropical America. Known in West Africa from Sierra Leone, Gold Coast, Nigeria, etc., probably naturalised.

A handsome decorative climber, often cultivated.

Quamoclit vulgaris, *Choisy*; Fl. Trop. Afr. IV. Sect. 2, p. 128.

Ill.—Rheede, Hort. Mal. xi. t. 60; Rumpf. Amb. v. t. 155; Lam. Encycl. t. 104 (*Ipomoea Quamoclit*); Bot. Mag. t. 244 (*Ipomoea Quamoclit*); Barton, Fl. N. Amer. iii. t. 96.

Vernac. names.—Kamalata (Sanskrit, *Dymock*); Sita-che-Kes (Maratha, *Dymock*).—Winged leaved Ipomoea; Cupid's Flower.

Native of America. Introduced to West Africa and widely distributed in the warmer parts of the Old World.

The pounded leaves are said to have cooling properties and are applied to piles and carbuncles, India (Dymock, Pharmacog. India, ii. p. 540).

A handsome twining annual. Cultivated in the garden, Oloke-Meji (Dodd, Herb. Kew).

Ipomoea, Linn.

Ipomoea aquatica, *Forsk.*; Fl. Trop. Afr. IV. Sect. 2, p. 170.

Ill.—Rheede, Hort. Mal. xi. t. 52.

Vernac. names.—Furin gaddu (Katagum, *Dalziel*); Kangkong (Malaya, *Ridley*).

Widely distributed in Tropical Africa, Asia and N. Australia.

Eaten as a vegetable in India (Moloney, For. W. Afr. p. 390), the young shoots, leaves and roots are eaten. The variety with white roots is cultivated in Madras, being propagated by small pieces of the creeper about 6 in. long (Dict. Econ. Prod. India); also cultivated by the Chinese and in Malaya (Agric. Bull. Str. Settl. and Fed. Malay States 1898, p. 186).

An annual plant trailing on muddy river banks or in the water. Seen constantly along the banks of Nigerian rivers (Parsons, Herb. Kew), on the shores of Lake Chad (Elliott, Herb. Kew), and prostrate in muddy places, Katagum (Dalziel, Herb. Kew). Propagated by cuttings, grows quickly and might be cultivated like water-cress.*

Ref.—"*Ipomoea aquatica*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 476–478.

Ipomoea Batatas, *Lam.*; Fl. Trop. Afr. IV. Sect. 2, p. 175.

Ill.—Rheede, Hort. Mal. vii. t. 50; Catesby, Nat. Hist. Carolina, Florida and Bahama Is. ii. t. 60 (*Convolvulus radice tuberoso esculenta*); Tussac, Ant. iv. t. 1; Desc. Ant. viii. t. 545, t. 546 (var. "Patate des dunes," "Patate de Samana"); Duthie, Field crops, tt. 87, 88; Sinclair, Indig. Fl. Hawaiian Is. t. 15; Zippel, Ausl. Handels, Nährpfl. t. 59 (*Batatas edulis*); Jumelle, Les Cult. Col. Pl. Aliment. p. 63, f. 18; Bailey, Cycl. American Hortic. p. 1756, f. 2446 (leaves of the varieties "Bermuda Red," "Orleans Red," "Vineless," "Bunch Yam," "Pumpkin Yam," "Yellow Yam"); Bull. Econ. Indo-China, 1905, pp. 1184, 1185.

Vernac. names.—Dankali (Hausa, *Dudgeon*, *Parsons*); Odunkun-pupa (Lagos, Oloke-Meji, *Dodd*); Odunkun (Lagos, *Dawodu*); [Patato (Mandingo), Patat (Joloff) *Dudgeon*]; Odunkun fanfun (Lagos, *Dennett*); [Atombo (Accra), Santoon (Fanti), Koo Koon Doo Koo (Sierra Leone) *Easmon*]; Veeazee (Cent. Afr., *Grant*); Cara (Golungo Alto, *Welwitsch*); [Uala (Hawaii), Kumara (New Zealand), Uala or Umara (Tahiti) *Sinclair*]; [Hung-Shao (Hupeh), Pen-Shao (Szech-uan) *Wilson*).—Sweet Potato, Spanish Potatoes, and according to Loudon (Encycl. Pl. p. 140) the potato of Shakespeare's time.

Throughout the tropics of the Old and New Worlds, and in many sub-tropical countries.

The leaves cooked with fungi are eaten like spinach, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iii. p. 73), and the stems and leaves (or vines) are good fodder green or dried for cattle, sheep and pigs.

The chief value of the plant lies in the roots or tubers for food, used in the same way as the common potato. For feeding to animals, owing to the high percentage of starch, they require to be mixed with some food of greater nitrogenous value, as peanuts (*Arachis hypogaea*), cowpeas (*Vigna Catjang*), cotton-seed meal

* Water-cress (*Lepidium sativum*), Vernacular name "Laussur," is cultivated in the neighbourhood of Kano, and according to a note on a specimen collected by Dalziel (No. 333, Herb. Kew), it is sold in the markets there.

or grain, to form a suitable ration. The addition of ½ lb. of cotton seed meal or 1 lb. of cowpeas to 10 lb. (Agric. News. Barbados, iii. 1904, p. 330) or one bushel of peanuts ground in the shells to 3 bushels of sweet potatoes is recommended for stock, and on farms where this crop is grown largely the culls are fed to hogs, together with a one-third or one-half ration of corn (Beattie, U.S. Dept. Agric. Farmers' Bull. No. 324, 1908, p. 38).

The tubers are capable of yielding a high percentage of alcohol and it has been estimated that those containing 25 per cent. of starch will yield approximately 38 gallons of spirit per ton (Wiley and Sawyer, U.S. Dept. Agric. Farmers' Bull. No. 429, 1911, p. 20; Kew Bull. 1912, p. 119).

An analysis made by Messrs. Burgoyne, Burbidges and Co., London, of sweet potatoes submitted from the Royal Gardens, Kew, in 1887, showed—Albumen 8·7 per cent., Fatty oils 0·7, Cellulose 5·6, Salt 4·7, and Starch 80·3 per cent., on material dried at 212° F., the value at that time being put at 5s. per cwt. the price being regulated by that of rice and maize—the two materials chiefly used by British Distillers (Mus. Kew). The distillation of alcohol from the raw sweet potato was then being given special attention in the Azores. In 1884, 1826 pipes of alcohol, value £40,588, were exported to Lisbon, where it was used for the fortification of wines. The fresh potatoes in the same year were selling at St. Michael's for 180 reis (about 9d.) per 15 kilos from January to March and 120–150 reis (about 6d.–7½d.) per 15 kilos from October to December (Cons. Rep. Part. ix. 1885, pp. 1816, 1817; European Mail, Aug. 26th, 1886). The trade appears to be still maintained, alcohol to the value of £15,959 being exported from St. Michael's in 1912 (Cons. Rep. Ann. No. 5300, 1914, p. 6). Starch from Mauritius on analysis shows a satisfactory composition and has been valued (1910) in this country at £8 per ton (Bull. Imp. Inst. viii. 1910, p. 8). It has been found in Natal that 3 tons of starch can be made from 12 tons of sweet potatoes, the residue being suitable for cattle food (Board of Trade Journ. July 16th, 1908, p. 137); the price for Natal starch flour from this potato, in 1913 when 150 tons were exported to the United Kingdom, was £10–£11 per ton (l.c. Feb. 13th, 1913, p. 407).

Sweet potatoes do not keep so well as the ordinary potato or the "yam" (*Dioscorea sativa*), though by careful handling and storing in a warm dry atmosphere they may keep long enough to admit of export or to meet the conditions of a local trade in them. In China they are preserved by being cut up into slices or strips which are first scalded in boiling water and afterwards dried in the sun in which form they are exhibited for sale; the starch, extracted by macerating the tubers in cold water is manufactured into vermicelli and a jelly is also made from the starch (Hosie, Rep. Prov. of Ssu-chuan, China, No. 5, 1904, pp. 12, 18; Wilson, A Naturalist in W. China, ii. p. 58).

A small trade between the West Indies (Barbados) and this country has arisen in the course of the last few years. In 1908–09 72 barrels, and in 1909–10, 48 barrels of sweet potatoes were shipped

to London (Rep. Dept. Agric. Barbados, 1909–10, p. 15); value here retail about 4s.–5s. for 28 lb. or about 18s. 6d. a barrel. They fetch about the same price (2d. to 3d.) per lb. retail in Paris, shipped from Algiers, where a remunerative price to the farmers is put at about ¼d. per lb. or 50 francs a ton (Cons. Rep. Ann. No. 5256, 1914, p. 11). The local value in the Province of Bassa, Northern Nigeria, is 1d. per 10 lb. (Byng-Hall, N. Nig. Gaz. 30th June, 1913, p. 241), and approximately the same (·16d. per lb.) in Kontagora (Clarke, N. Nig. Gaz. l.c. p. 243, "Dankali"). The cost of production in Nigeria does not appear to have been recorded, but in all countries this would vary greatly. In the United States the approximate cost (exclusive of rent and fertilisers) of growing and harvesting an acre of sweet potatoes is estimated at 20 dollars (Duggar, U.S. Dept. Agric. Farmers' Bull. No. 26, 1897, p. 29).

The requirements under cultivation are a warm climate, good rainfall of 30–50 in. and upwards, rich, light, well-drained soil or good loam, and the plants may take from 4 to 6 months to come to maturity. Unripe potatoes change to a more or less green colour when cut through, but when ripe they do not change colour. Propagated from sets (tubers) or cuttings 1–2 ft. long, they may be put out and given the same space approximately as mentioned under Cucurbits (see p. 340), or if grown on ridges, say 4 ft. apart, the cuttings or sets could be put in about 2 ft. apart in the rows, and like these plants are well adapted to growing under irrigation. The yield may vary according to the variety and local conditions from about 5000 to 20,000 lb. per acre. The yield in the Bassa Province, N. Nigeria, is given at 1650 lb. per acre (Byng-Hall, l.c.) and in Kontagora as 61 masuka of 38 lb. each = 2318 lb. (Clarke, N. Nig. Gaz. l.c. p. 243, "Dankali").

Specially large yields per acre have been obtained in Louisiana from the varieties "Providence"—1072 bushels, "Shanghai"—758, "Red Nansemond"—717, "Peabody"—696, "Norton"—654, "Hayman"—651, "Southern Queen"—640, "Georgia"—580, "Ticotia"—568, "Southern Red Yam"—555, "Barbadoes"—531, "Negro Choker"—534, and "Spanish Yam"—520 bushels (Duggar, U.S. Dept. Agric. Farmers' Bull. No. 26, 1897, p. 20).

This crop is grown more or less throughout Nigeria. In Kano and Zaria it is grown in rotation with corn and millet, occupying the ground in the second and eighth year; near Bida very high beds are made for the plants, resembling flat-topped mounds with an area of 16 or more square feet (Dudgeon, Agric. and For. Prod. W. Afr. pp. 15, 154; N. Nig. Gaz. July 31st, 1909, p. 150). In Yoruba-land it is grown in rotation with maize, yams, beans, etc. (Kew Bull. 1890, p. 243). In B.E. Africa the natives of Kikuyu feed their sheep on the growing vines with excellent results, the plants being grown from cuttings and covering the ground in about two months' time (Col. Rep. Ann. No. 519, 1907, p. 100).

There are upwards of 50 varieties of the plant under cultivation, distinguished by the deeply lobed, slightly lobed, or

rounded entire leaf, its venation, the colour of the petioles, etc. The variety selected for any particular locality would depend largely on the soil and whether the tubers were intended for table, feeding stock, export, or for the production of alcohol. Usually those with white potatoes, as "Gentleman's Table," "White Sealy," "Brazilian," "Southern Queen," etc., are the best for table use; heavy croppers, as "Southern Queen," "Red Bermuda," etc., for stock feeding, and for the extraction of alcohol.

In Montserrat "Jim Gage" is a good all-round variety generally cultivated by the peasants; it gives a yield of over 11,000 lb. per acre (Rep. Bot. St. Montserrat, 1909–10, p. 12), and is a strong grower with yellowish-white potatoes. Other varieties commonly cultivated in the island are "Nor'ard 18" (red potato), yield over 7000 lb. per acre; "Geranium" (red potato), yield over 8000 lb.; "Jackass" (yellow-white potato), yield over 10,000 lb.; "Bett Weeks" (dark-red potato), yield over 10,000 lb., and "Blue Belle" (white potato), yield over 7000 lb. per acre (l.c. 1910–11, p. 10).

In Algeria the varieties "Reine du Sud" and "Dorée des Açores" are considered the best varieties to grow for export, and "Blanche de Malte," giving a large crop of inferior quality is recommended for cattle (Cons. Rep. No. 5256, 1914, p. 11).

In the United States the variety "Southern Queen" is most extensively grown for market purposes, stock feeding and for home use in the South Atlantic and Gulf Coast States; "Black Spanish" or "Nigger Choker" (potato dark purple outside, snowy-white flesh) though of poor quality is grown mostly for stock feeding. Other varieties grown are "Big Stem Jersey," potatoes yellow, a good commercial variety; "Yellow Jersey," potatoes yellow, adapted for home use; "Red Jersey," potatoes red, suitable for home use; "Pumpkin Yam," potatoes dull yellow, suitable for home use and stock feeding; "Red Bermuda," potatoes rose red, for stock feeding; "Florida," potatoes light salmon yellow, adapted for home use, and "Pierson," potatoes light yellow, extensively grown for the early markets (Beattie, U.S. Dept. Agric. Farmers' Bull. No. 324, 1908, pp. 35–37) and see also others mentioned under yield.

Ref.—"*Ipomoea Batatas*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 478–482.——Sweet Potatoes, Starnes, Georgia Exp. St. Bull. No. 25, 1894.——"The Sweet Potato as a Starch Producer," Shiver, South Carolina, Exp. St. Clemson Agric. Coll. Bull. No. 28, 1897, pp. 1–15.——Sweet Potatoes: Culture and Uses, Duggar, U.S. Dept. Agric. Farmers' Bull. No. 26, 1897, pp. 1–29.——"*Ipomoea Batatas*," in Les Cultures Coloniales: Pl. Alimentaires, Jumelle, pp. 62–67 (J B. Ballière et Fils, Paris, 1901).——Sweet Potatoes, Nesbit, U.S. Dept. Agric. Farmers' Bull. No. 129, 1901, pp. 1–40.——Sweet Potatoes from the West Indies, Pamphlet No. 6, 1901, pp. 1–5, issued by the Commissioner. Imp. Dept. Agric. W. Indies (Dulau and Co., London).——"Sweet Potato." L. H. B., and H. N. Starnes, in

Cycl. American Horticulture, Bailey, pp. 1754-1757 (Macmillan and Co., Ltd., London and New York, 1902).——"Experiments with Sweet Potatoes at Barbadoes," Hall and Bovell, in West Indian Bull. v. 1904, pp. 41–52, with analyses of Potatoes and Vines, 28 varieties.——"Sweet Potato Trials, 1904," Cousins, in Bull. Dept. Agric. Jamaica, ii. Dec. 1904, pp. 275–279, with descriptions of the plants and analyses of the potatoes of 16 varieties.——"Patate douce, *Ipomoea Batatas*," in Les Pl. Potagères, Vilmorin-Andrieux, pp. 484–485 (Paris, 1904): English Translation, Robinson, pp. 601–604 (John Murray, London, 1905).——"Sweet Potatoes," in Potatoes and other Root Crops as Food, Langworthy, U.S. Dept. Agric. Farmers' Bull. No. 295, 1907, pp. 23–28.——"Sweet Potato, *Ipomoea Batatas*," Waite, in Cycl. American Agric. Bailey, ii. pp. 613–623, illustrated, ff. 838–847 (Macmillan and Co., Ltd., London and New York, 1907).——Sweet Potatoes, Beattie, U.S. Dept. Agric. Farmers' Bull. No. 324, 1908, pp. 1–39, illustrated.——"*Ipomoea Batatas*," in Comm. Prod. India, Watt, pp. 687–688.——"Patates douces," De Wildeman, in Ann. L'Inst. Col. Marseille, vii. 1909, "Pl. Cult. Afr. Trop." pp. 312–314.——The Storage and Marketing of Sweet Potatoes, Beattie, U.S. Dept. Agric. Farmers' Bull. No. 520, 1912, pp. 1–16, illustrated.——"The Classification of Sweet Potatoes," Robson, in West Indian Bull. xii. 1912, pp. 521–526.——"Patates-douces," E. D. W. in Bull. de L'Assoc. des Planteurs de Caoutchouc, V. April, 1913, pp. 80–85.——"Patates-douces," in Notes Prod. Veg. Trop. De Wildeman, pp. 87–102 (Anvers, 1914).

Ipomoea digitata, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 189.

Ill.—Pal. de Beauv. Fl. Oware et Benin, ii. t. 101 (*I. ennealoba*), t. 105 (*I. eriosperma*); Jacq. Hort. Schoenbr. ii. t. 200 (*I. mauritania*); Bot. Reg. (1815) t. 62 (*I. paniculata*); (1815) t. 75 (*I. insignis*); (1818) t. 333 (*I. platensis*); Andr. Rep. x. t. 636 (*I. insignis*); Bot. Mag. t. 1790 (*I. insignis*); t. 3685 (*I. platensis*); Rev. Hort. 1853, p. 381; Bettfreund, Fl. Argent. iii. t. 119.

Vernac. names.—Atewo Edun (Lagos, *Dawodu*); Bilaikand (India, *Dymock, Watt*), Bhumichekri Gadde (India, *Watt*).

Widely distributed in Tropical Africa and in the Tropics.

The tuberous roots are used for various medicinal purposes—tonic, alterative, demulcent, etc.; and the stems and leaves are used as fodder for cattle in India (Dict. Econ. Prod. India).

A perennial plant with tuberous roots sometimes nearly 50 lb. in weight, not edible. A strong climber, very ornamental. Monteiro (Jan. 1873, Herb. Kew) refers to it as a magnificent creeper in Angola, with its magenta coloured flowers; also at Lokoja (Parsons, No. 120, 1908, Herb. Kew), and at Abinsi (Dalziel, No. 682, 1913, Herb. Kew).

Ref.—"*Ipomoea digitata*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 484–485.——"*Ipomoea digitata*," in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 534–536.

Ipomoea hederacea, *Jacq.*; Fl. Trop. Afr. IV. Sect. 2, p. 159.

Ill.—Bot. Mag. t. 188 (*Convolvulus Nil*); Jacq. Ic. t. 36; Bot. Reg. (1815), t. 85; Rev. Hort. 1868, p. 34 (var. *foliis marmoratis*); Collett, Fl. Simla, p. 337.

Vernac. names.—Yako (Yokoto, *Dalziel*); Asagao (Japan, *Woolley*); Kalu-dana (India, *Drury*, *Moloney*).—Blue American Ipomoea, Morning Glory, Azure Convolvulus.

Common in West Africa and generally throughout the Tropics.

The seeds are used in India as a cathartic, recommended as a substitute for jalap (*Ipomoea purga*) (Watt, Dymock, *seq.*), and for a similar purpose in Japan (Woolley, Mus. Kew).

An annual plant twining and ornamental. Flowers pale blue in the morning changing to pink, common on fences in native villages, Sokoto (Dalziel, No. 376, 1914, Herb. Kew).

Ref.—"*Ipomoea hederacea*," in Dict. Econ. Prod. India, Watt, iv. 1890, pp. 485–487.——"*Ipomoea hederacea*," in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 530–532.

Ipomoea involucrata, *Beauv.*; Fl. Trop. Afr. IV. Sect. 2, p. 150.

Ill.—Pal. de Beauv. Fl. Oware et Benin, ii. t. 89.

Vernac. names.—Ododo oko (Yoruba, *Millson*); Alukerese (Lagos, *Dawodu*).

Widely distributed in Tropical Africa.

An ornamental twining annual, large rose-red flowers, limb of the corolla up to 2 in. in diameter.

Ipomoea palmata, *Forsk.*; Fl. Trop. Afr. IV. Sect. 2, p. 178.

Ill.—Bot. Mag. t. 699 (*Convolvulus cairicus*); Pal de Beauv. Fl. Oware et Benin, ii. t. 106 (*Ipomoea vesiculosa*).

Egyptian Bindweed (St. Helena, *Mellis*).

Throughout Africa and the Tropics generally.

A twining, ornamental perennial; bright red-purple flowers.

SOLANACEAE.

Lycopersicum, Hill.

Lycopersicum esculentum, *Mill.*; Gard. Dict. Ed. viii. n. 2.

An annual plant, of trailing habit, 2–3 ft. high. Leaves more or less pinnate, the leaflets slightly divided, attenuate at the apex, pilose, glaucescent. Flowers green, insignificant. Fruit a berry, red or yellow when ripe, many seeded.

Vernac. names.—Tomatu (Hausa, *Parsons*); Amch Osehbeh (Accra, *Easmon*); Makana Sora (Siam, *Kerr*); Camatis (Philippines, *Burrel*).—The Tomato.

Cultivated for its fruit in many parts of Nigeria and through Africa—where it is sometimes found semi-wild in the neighbourhood of abandoned camps—and in most warm countries. Tomato growing is an important industry in Italy, Sicily, United

States, Mexico, West Indies, Egypt, Canary Islands, etc. It is estimated that in Italy, in the Province of Parma chiefly there are 84,000 tons of fruits preserved annually (L'Agric. Commerciale, 1st Sept. 1911, p. 464; Inter. Inst. Agric. Rome, Bull. Bur. Agric. Intell. Aug. Sept. Oct. 1911, p. 2296), and Italian Tomato Paste is largely imported into the United States—15,458 tons out of 25,338 tons in 1913 from Naples district (Cons. Rep. Ann. No. 5396, 1914, p. 23), the wholesale price to retailers being 3·90 dollars per 100 tins containing 200 grams each (Inter. Inst. Agric. Bull. l.c. Jan. 1911, p. 113). In the United States approximately 10,000,000 cases are turned out from the canning factories (U.S. Dept. Agric. Farmers' Bull. No. 435, 1911, p. 8). Shipments of ripe tomatoes from the Gulf Coast region of Mexico and Cuba are made in large quantities to the United States markets, and in the United Kingdom the imports, chiefly from Canary Islands, Channel Islands, Spain, Holland, France, Portugal and Italy, amounted in 1913 to 1,582,986 cwts. value £1,348,682 (Trade of the United Kingdom, Vol. i. 1914, p. 203).

An oil obtained from the seeds suitable for soap-making has recently appeared on the market from Italy.

Under cultivation there are many varieties. Tracey (U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 21, 1903, pp. 353-371) enumerates 468 varieties. Upwards of 100 kinds have been specially tested at Wisley (Journ. Roy. Hort. Soc. xxix. pp. 675-678) and of those already on the markets it is difficult to recommend one more than another. "Sunrise"—fruits medium and even in size, dark red, round, smooth, averaging 11 fruits in a cluster, and a heavy cropper, is recorded as of exceptional value (l.c.); "Matchless," "Livingstones Beauty." "Acme," and "Bulgiano's Best" have been tested and found successful in Cuba (Austen and Halstead, Est. Cent. Agron. de Cuba, Bull. No. 13, 1908, p. 44); "Sutton's Maincrop," "Trophy" and "Challenger," were grown successfully (1901) at Old Calabar, and so the list of suitable varieties to grow might be readily extended. According to Parsons (The N. Nig. Gaz. April 30th, 1910, p. 101) the tomato is thoroughly at home in Zaria.

Seeds may be sown in pots, boxes or nursery beds, pricked off when large enough to handle and planted out in permanent places when about 6 inches high, or when about 4–6 weeks old. The main requirements are a warm climate, moderate rainfall, good, well-drained soil, and careful training and thinning out of necessary growth; all parts of the plant require full light and air. In field work the rows should be from $3\frac{1}{2}$–4 ft. wide and the plants in them from $2\frac{1}{2}$–3 ft. apart. The yield may vary according to the variety and cultural conditions from 5–12 tons per acre. The plants begin to bear in from 10–18 weeks, continuing for several weeks if the fruits are taken off immediately they begin to show colour, at which stage they will ripen in a few days if carefully laid out in store, exposed to light and air, or packed for transit. By sowing at regular intervals of say from 4–6 weeks a supply could be maintained nearly the whole year round.

Ref.—Tomato Growing in New Hampshire: Notes on Tomato Breeding, Rane and Hunt, New Hampshire College, Agric. Exp, Station, Bull. No. 42, 1897, pp. 15-26, with particulars of 56 varieties.——"Tomatoes in Canary Islands," in Dip. and Cons. Rep. No. 2830, 1902, p. 10.——"The Tomato," Kyle and Green, Texas Agric. Exp. St. Bull. No. 65, 1903, pp. 1–31.——"Tomate" in Pl. Potagères, Vilmorin-Andrieux, pp. 663–680: illustrated (Paris, 1904); English Translation, Robinson, pp. 707–730 (John Murray, London, 1905).— -"Report on Tomatoes at Wisley, in Journ. Roy. Hort. Soc. xxix. 1904-05, pp. 675-678.——Tomatoes, Corbett, U.S. Dept. Agric. Farmers' Bull. No. 220, 1905, pp. 1–32, illustrated.——"Tomatos," Canary Isles, in Dip. and Cons. Rep. No. 3879, Ann. 1907, p. 7. —"Tomatos, Analysis of," in Pharm. Journ. Sept. 14th, 1907, p. 361.——"Tomatoes," Austen and Halstead, Est. Cent. Agron. de Cuba, Bull. No. 13, 1908, pp. 39, 41.— —"Growing Tomatoes for the Canning Factory," Woodbury, Agric. Exp. Station, Purdue University, Indiana, Bull. No. 144, May, 1910, pp. 511–528; Abstract in U.S. Dept. Agric. Farmers' Bull. No. 435, 1911, pp. 8–12.——"Tomatoes in Sicily," Coltivazione Razionale del pomodoro, Agughiaro, pp. 1-46 (Catania, 1911).——"Italian Tomato Products," in Journ. Roy. Soc. Arts, lix. 1911, p. 1123.——"Tomato Preserving in France," l.c. lix. 1911, p. 1044.——"Canning Tomatoes at Home and in Club Work, Benson, U.S. Dept. Agric. Farmers' Bull. No. 521, 1913, pp. 1–36.——"Tomato Seed Oil in Italy," Journ. Roy. Soc. Arts, lxii. 1914, p. 404.

Solanum, Linn.

Solanum duplosinuatum, *Klotzsch*; Fl. Trop. Afr. IV. Sect. 2, p. 243.

Ill.—Wiener, Ill. Gart. Zeitung, 1896, p. 405, f. 59 (*S. Farini*); Wood, Natal Pl. i. t. 49.

Vernac. names.—Mafewobamomi (Lagos, *Dawodu*); Boboawodi (Lagos, *MacLeod, Hislop, Foster*); Bore (Sierra Leone, *Scott Elliot*); Toongueeza or Toong'goojah (Unyoro, Uganda, *Grant*); Beet-y-diau (Yoloff, *Heckel*); Umtuma (Natal, *Wood*).

Widely distributed in Tropical Africa extending to S. Africa.

Used as an antidote to Strophanthus poison in Africa (Holmes, Pharm. Journ. [4] xxiv. 1907, p. 129). Berries used with some success as a remedy for ringworm (Wood, Natal Pl. i. p. 40).

The variety *semiglabrum*, C. H. Wright, is stated by Barter (No. 1344, Herb. Kew) to be cultivated for its fruit—yellow when ripe, smooth surface, size of a tomato—in Nupe.

A shrub about 3 ft. high; all the plant spiny (Barter, l.c.) sometimes almost unarmed, sometimes bristling with white yellowish prickles (Hiern, Cat. Welw. Afr. Pl. iii. p. 750); found in native compound, Lokoja (Dalziel, Herb. Kew), very abundant all over interior of Angola (Monteiro, Herb. Kew).

Solanum incanum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 238.

Ill.—Ruiz Lopez and Pavon, Fl. Peruv. Tabulae ined. ii. t. 175, f. b. (*S. incanum*); Delile, Egypte, t. 23, f. 1 (*S. coagulans*); Blanco, Fl. Filip. t. 49 (*S. coagulans*).

Vernac. names.—Gautan Kura or Gauta Kara (Hausa, Katagum, Yola, *Dalziel*); Zovobib (S. W. Africa, Chem. and Druggist, Feb. 4th. 1911, p. 64); Khadak (Arabic Jericho, *Vester & Co.*); Gibbein (Arabic, *Muriel*); Hyaena's tomato (Dalziel, transl. of Hausa name above).

Yola, Katagum, Jebba in N. Nigeria, Nile Land region to Mozambique, S. Africa, Arabia and India.

A poison, Katagum (Dalziel, l.c.); poisonous, suspected of causing lamziekte in S. Africa (Burtt-Davy, Ann. Rep. Agrost. & Bot. Dept. Agric. Union of S. Afr. p. 224); root used by the natives as a remedy for gonorrhoea, S.W. Africa (Bull. Bur. Agric. Intellig. Rome, Jan. 1911, p. 109; Chem. and Druggist, Feb. 4, 1911, p. 64).

Found as a bush 5 ft. high, Blue Nile (Muriel, Herb. Kew).

Solanum Melongena, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 242.

Ill.—Rheede, Hort. Mal. ii. t. 37; x. t. 74 (var.); Rumpf, Amb. v. t. 85; Plenck. Ic. t. 123; Dunal, Hist. Solonac. t. 3; Desc. Ant. iii. t. 187; Blanco, Fl. Filip. i. t. 265; Wight, Illust. t. 166; Duthie, Field Crops, t. 95.

Vernac. names.—Igba (Lagos, *Dawodu*); Yundahl (Katan, Hadramaut, *Lunt*); [Schbeh (Accra), Nturabah (Fanti), Ikan (Nargo), Squash (Sierra Leone) *Easmon*]; Nyaron (F. W. Afr. *Chevalier*); Talong (Philippines, *Burrel*).—Garden Egg, Egg Plant, Brinjal, Aubergine, Jew's Apple.

Throughout Tropical Africa and most warm countries.

Var. **inerme,** *Hiern*; Fl. Trop. Afr. l.c., known from West Africa, S.W. Africa and Mozambique District.

Vernac. names.—Yalo (Katagum, *Dalziel*); N'Gilla (Golungo Alto, *Welwitsch*).

Fruit used as a vegetable. The root used medicinally in French Guiana (Heckel, Les. Pl. Med. et Toxiq. Guy. Franç. in Ann. Inst. Col. Marseille, iv. 1897, p. 88).

A shrubby spiny plant 3–4 ft. high. Cultivated in Katagum (Dalziel, Herb. Kew), on a small scale near houses in N. Nigeria (Dudgeon, Agric. and For. Prod. W. Afr. p. 155; Ann. Rep. Agric. July 31st, 1909, p. 159—"Yala," a minor food crop), at Katan, Hadramaut, altitude 1150 ft. (Lunt, Herb. Kew), Golungo Alto —wild and cultivated (Hiern, Cat. Welw. Afr. Pl. iii. p. 749), in villages near Conakry (Teissonier, L'Agric. Prat. pays chauds i. 1901–02, p. 166), and generally throughout the tropics and sub-tropics. Under cultivation there are many varieties. Tracy enumerates (U.S. Dept. Agric. Bureau of Pl. Industry, Bull. No. 21, 1903, pp. 183–187) 114 varieties in the United States.

"Violette ronde" and "blanche ronde" varieties are distinguished in Dahomey (L'Agric. prat. pays chauds. ii. 1902–03, p. 29); "New York Purple" and "Black Beauty" are recommended in Cuba (Austen and Halstead, Est. Cent. Agron, Cuba, Bull. No. 13, 1908, p. 39).

Five varieties are mentioned as cultivated in Szechuan, China, "Chin pa tzu"—long purple; "Tung Kuan"—round purple; "Tzu hua"—long purple green striped; "Nui nai"—long purple and "Pai"—long light green, supplying the market from June to October (Hosie, Report No. 5, 1904, p. 15).

Seeds may be sown in boxes or seed-beds at intervals during the year; the seedlings kept carefully watered, and they may be planted out when about 18 in. high in rows 2½–3 ft. apart. A rich, well drained soil and moderate rainfall is essential. The plants begin to bear in about 3 or 4 months and may be kept in season throughout the year.

Ref.—"*Solanum Melongena*," in Field and Garden Crops, N.W. Prov. and Oudh, Duthie and Fuller, iii. pp. 31–32.——"*Solanum Melongena*," in Dict. Econ. Prod. India, Watt, vi. part iii. A. 1893, pp. 258–262.——"*Solanum Melongena*," in Comm. Prod. India, Watt, pp. 1026–1028.——"Aubergine *Solanum Melongena*," in Pl. Potagères, Vilmorin-Andrieux, pp. 22–30, illustrated; English Translation, Robinson, pp. 289–294.

Solanum nodiflorum, *Jacq.*; Fl. Trop. Afr. IV. Sect. 2, p. 218.

Ill.—Jacq. Ic. Pl. Rar. ii. t. 326; Bettfreund, Fl. Argent. iii. t. 153.

Vernac. names.—Disue (Golungo Alto, *Welwitsch*); Herva Moira (Portuguese, *Welwitsch*); Anamamy (Madagascar, *Heckel*).

In West Africa from Senegal to the Cameroons, and extending through Tropical Africa to Mozambique.

The berries resemble small grapes—black or blackish-purple in colour. The deep purple juice is used by the natives of Golungo Alto as ink. Welwitsch is said to have used it for writing his notes relating to the specimens. He states that on some documents in the Government office at Golungo Alto the writing done with the purple ink of these berries had, after upwards of 40 years, preserved its original colour (Hiern, Cat. Welw. Afr. Pl. iii. p. 746). The plant is used as a vegetable mixed with rice or as spinach, and the leaves pounded and mixed with those of palma-christi and native saffron (*Curcuma longa*) are used to make a wash for the cure of "Tomboka" or anthrax and bubos, Madagascar (Heckel, Ann. L'Inst. Col. Marseille, i. 1903, 2nd fasc. p. 76, *Solanum nigrum*, var. *nodiflorum*).

A herbaceous plant, flowering and fruiting freely, sometimes shrubby, 1–4 ft. high, in the Cameroon Mts. 7000–10,000 ft. (Mann, Herb. Kew); found about Nupe but not common (Barter, Herb. Kew), in places neglected after cultivation and about

negro villages in Golungo Alto, in flower and fruit in January, June, July and middle of August (Hiern, l.c. p. 746).

Solanum tuberosum, *Linn.* Sp. Pl. (1753) p. 185.

An annual plant well known in gardens and fields at home.

The Potato.

Native of Chili, but spread by cultivation over nearly the whole world—warm, temperate, subtropical and tropical. In Africa it has been grown with some success, in Nigeria at Old Calabar (1901), at Ibadan (Govt. Gaz. S. Nigeria, Mar. 3rd, 1909, Suppl. p. 11), on the banks of the Niger (French), where Europeans are stated to be getting yields as good as in France (Bull. Bur. Agric. Intellig. Rome, Dec. 1910, p. 196: Chevalier, "Agric. Trade in the Valley of the Niger," L'Agric. Comm. Paris, Nov. 27, 1910), the Gold Coast—seed from the Canary Isles (Crowther, Col. Rep. Misc. No. 1, 1891, p. 51), in Southern Angola—1,269,000 kilog. grown in 1911 (Bull. Bur. Agric. l.c. 1911, p. 1887), in the Kikuyu country, Uganda Railway (altitude about 7000 ft.), where (1902) the few European planters there grow potatoes as a staple crop, the yield without manure being 3000–7000 lb. per acre, realising in the local markets 2–5 rupees per load of 60 lb. (Lyne, Cons. Rep. Misc. No. 577, 1902, p. 4), in Makindu, E. Africa Protectorate nearly 8 tons per acre of good quality have been obtained (Col. Rep. Ann. No. 519, 1907, p. 85), in Jamaica, Bermudas, India, Ceylon, Upper Burma, and the Assam Hills the potato is under successful cultivation (see *refs.*). Other instances might be given but the above are enough to show that considerable interest is being taken in this plant in hot countries and where ground at a suitable altitude (2000–5000 ft. or so) can be attained the cultivation need not be met with much difficulty.

The requirements under cultivation are a rich sandy loam, thoroughly drained, a warm climate and moderate rainfall.

Reproduction is invariably effected by tubers or "sets." In European countries large potatoes are often cut into halves or quarters, but generally small selected whole tubers are used and in the tropics it is advisable to use the latter. "Greening" of potatoes, that is exposing them to light in layers to induce strong "sprits" before planting, is recommended. Set 4 in. deep at distances of 1 ft. in shallow drills 2–3 ft. apart, they come to maturity in from 3–5 months, and a good crop is from 5–10 tons. Earthing up as occasion requires will be necessary during growth to keep the young potatoes covered. Seed potatoes are usually better imported and a large export trade of several thousand tons a year is carried on from France (chiefly Bordeaux) to S. America and British Colonies, especially in S. Africa. They are packed in specially prepared (ventilated) boxes containing two separate layers of 15 kilog. (nearly 50 lb.) in all about 100 lb. of potatoes, the gross weight of the boxes being about 115 lb.; the first cost may vary from

£3–£4 10s. and upwards per ton, according to season, the favourite varieties being "Early Rose," "Jaune Ronde," "Chardonne," "Beauvais Ronde," "Up-to-Date," "Institution de Bauvais" and "Richter's Imperator" (Journ. Roy. Soc. Arts, lxii. 1914, p. 662). "Early Rose" and "Up-to-Date" seem to be two varieties most in demand for East Africa and S. Africa; "Sutton's Ringleader" was tried at Old Calabar (1901), and "Chiswick Favourite," "Imperator" and "Adirondack" have yielded satisfactory crops at Hakgala, Ceylon (Trimen, Roy. Bot. Gardens, Ceylon, Report, 1890, p. 13). There are upwards of 500 good varieties known and no purpose could be served by suggesting more than those mentioned; full particulars of them all together with the separate industries of Drying Potatoes, the Production of Starch and Alcohol are given in the following works. A curious industry was started several years ago in Berlin for the manufacture of lead pencils, a composition made from potatoes taking the place of the cedar wood (Monthly Cons. and Trade Rep., Washington, Aug. 1907, p. 26).

Ref.—"The Potato and Its Culture," Ghosha, in Journ. Agric. Hort. Soc. India, ii. 1871, pp. 296–309.——"*Solanum tuberosum*," in Dict. Econ. Prod. India, Watt, vi. part III. A, 1893, pp. 265–272.——Potatoes, Sutton, pp. 1–44, illust. (Simpkin, Marshall & Co. London): Reprint from Journ. Roy. Hort. Soc. xix. 1896, pp. 387–430.——Potato Culture, Duggar, U.S. Dept. Agric. Farmers' Bull. No. 35, 1896, pp. 1–23.——Potatoes: Varieties: Fertilizers: Scab, Rane and Hunt, New Hampshire Coll. Agric. Exp. St. Bull. No. 41, 1897, pp. 1–14, with descriptions of 80 varieties and plate showing tubers of each.——Histoire de la Pomme de Terre: Traitée aux points de vue Historique, Biologique, Pathologique, Cultural et Utilitaire, Roze, pp. 1–464, illustrated (J. Rothschild, Paris, 1898).——The Potato, Sutton, pp. 1–75, illust. (Spottiswoode & Co. London): Reprint from Journ. Roy. Agric. Soc. England, ix. 1898, pp. 581–653.——"The Irish Potato," Price and Nees, Texas Agric. Exp. St. Bull. No. 54, 1899, Hort. Section, pp. 109–128, illustrated.——The Manufacture of Starch from Potatoes and Cassava, Wiley, U.S. Dept. Agric. Div. Chem. Bull. No. 58, 1900, pp. 1–48, including "The Use of Potatoes for the Manufacture of Alcohol," pp. 26–27.——"The Preparation and Use of Dried Potatoes," in Bull. Imp. Inst. i. 1903, pp. 77–80.——"Pomme de Terre: *Solanum tuberosum*," in Pl. Potagères, Vilmorin–Andrieux, pp. 573–620 (Paris, 1904) with descriptions of 153 varieties: English Translation, Robinson, pp. 550–601, illustrated.——Potatoes and Potato Culture, Râne and Hall, U.S. Dept. Agric. Exp. St. New Hampshire, Bull. No. 111, 1904, pp. 109–130, illustr.——The Book of the Potato, Sanders, pp. 1–222, with a list of 269 varieties (Collingridge, London, 1905).——The Potato, Fraser, pp. 1–185 (The Orange Judd Co. New York: Kegan Paul and Co. London, 1905).——The Potato and Its Culture, Macoun, Dept. of Agric. Ottawa, Canada, Bull. No. 49, 1905, pp. 1–48.——"Drying Potatoes in Germany," in Journ. Bd. of Agric. xiii. 1906, p. 358; l.c. xiv. 1907, p. 568.——

"Potato, *Solanum tuberosum*," Fraser, in Cycl. Amer. Agric. Bailey, ii. pp. 519–528.——Potatoes and Other Root Crops as Food, Langworthy, U.S. Dept. Agric. Farmers' Bull. No. 295, 1907, pp. 1–45; Potato, pp. 1–23.——"Potato Starch," in The World's Comm. Products, Freeman and Chandler, pp. 65–68 (Pitman and Sons, Ltd., London, 1907).——"*Solanum tuberosum*, in Comm. Prod. India, Watt, pp. 1028 1031.——"Potatoes at Wisley, 1908," in Journ. Roy. Hort. Soc. xxxiv. 1908–09, pp. 525–537, with descriptions of 96 varieties.——"Potatoes in Upper Burma," Thompstone, in Agric. Journ. India, v. 1910, pp. 85 89, pls. ii.–iv. illustrating varieties.——The Potato as a Truck Crop, Corbett, U.S. Dept. Agric. Farmers' Bull. No. 407, 1910, pp. 1–24.——Potato Culls as a Source of Industrial Alcohol, Wente and Tolman, U.S. Dept. Agric. Farmers' Bull. No. 410, 1910, pp. 1–40.——"Experiments in Potato Growing," Henshaw, in Journ. Bd. Agric. xvii. 1910, pp. 892–904.——Good Seed Potatoes and How to Produce Them. Stuart, U.S. Dept. Agric. Farmers' Bull No. 533, 1913, pp. 1–16.——"Export of Seed Potatoes from France," in Journ. Roy. Soc. Arts, lxii. 1914, pp. 662–663.——Potato Cultivation in the Assam Hills, Basu, Dept. Land Records and Agric. Assam. Bull. No. 3, 1914, pp. 1–6.

Physalis, Linn.

Physalis angulata, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 248.

Ill.—*Rheede*, Hort. Mal. x. t. 70; Dillenius, Hort. Eltham. tt. 11, 12 (*Alkekenji indicum* . . .); Blanco, Fl. Filip. t. 50; Wight, Illust. t. 166 bis, f. 6.

Vernac. names.—Domashin maza (Katagum, *Dalziel*); Cubum Pap (Gambia, *Brown Lester*); Sacabuche Anguloso (Porto Rico, *Cook and Collins*).

Nupe, Katagum, Kuka (Bornu), Lokoja in N. Nigeria, and known also from Sierra Leone, Togoland and Angola.

Used as an external counter-irritant, by the natives on the Gambia (Brown Lester, Kew Bull. 1891, p. 273).

A shrub 9 in. to 2 feet or more high; common in cultivated ground, Nupe (Barter, Herb. Kew), and waste places, Katagum (Dalziel, Herb. Kew).

Physalis minima, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 247.

Ill.—Rheede, Hort. Mal. x. t. 71; Dillenius, Hort. Eltham. t. 9 (*Alkekenji barbadense nanum*, etc.); Transv. Agric. Journ. iv. 1905–06, t. 106.

Vernac. names.—Karamanta (Katagum, *Dalziel*); Kindi (Sierra Leone, *Scott Elliot*); Caboboad (Angola, *Welwitsch*).

West Africa—Senegal to the Cameroons, extending to Angola, Uganda, Nyasaland, Portuguese East Africa, etc.

Fruit edible (Parsons, Herb. Kew); the fruit of the cultivated form is eaten and that of the var. *indica* is used medicinally as

a tonic, diuretic and purgative in India (Dict. Econ. Prod. India).

A small branching annual 1–2 ft. high; growing amongst stones and under cultivation at Baro (Parsons, Herb. Kew); in plantations of cotton and sugar, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iii. p. 750).

Physalis peruviana, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 248.

Ill.—Medic. Act. Acad. Theod. Palat. iv. Phys. t. 4 (*P. tomentosa*); Bot. Mag. t. 1068 (*P. edulis*); Penfold, Madeira Fl. Fr. and Ferns, t. 11 (*P. edulis*); Miers, Illustr. S. Amer. Pl. ii. t. 39; Trelease, 8th Report, Missouri Bot. Gdn. 1897, t. 44.

Cape Gooseberry.

Widely distributed in Tropical Africa and the Tropics generally. Naturalized in S. Africa; native of Peru.

The fruit makes an admirable preserve (Kew Bull. 1888, p. 16), yields large quantities of fruit in early spring, made into preserve much in favour with visitors, Madeira (Cons. Rep. Misc. No. 408, 1896, p. 9). A so-called "Bilberry" Jam is made of the fruits in St. Helena (Morris, Mus. Kew); commonly eaten in a fresh state. The calyces have been used as a subtitute for hops, Calcutta (Ogilvie, Mus. Kew).

A somewhat shrubby plant, 2–3 ft. high, stems herbaceous, rootstock perennial, commonly cultivated as an annual for its fruit and for ornamental purposes. There appears to be no record of this species in Nigeria but it is the best of the *Physalis*, and is easily grown from seed, thriving in any moderately rich soil and planted out in rows about 4 ft. apart, and 2 ft. in the rows, they come to maturity in from 5–7 months. It is found cultivated and wild in S. Africa (l.c.), on the Congo-Stanley Pool at an altitude of 900–1000 ft. (Hens, Herb. Kew), at Kikuyu, Uganda from 4000–6000 ft. (Whyte, Herb. Kew). etc.

Cyphomandra, Mart.

Cyphomandra betacea, *Sendt.* in Flora, xxviii (1845) p. 172.

A shrub or small tree 8–12 ft. high. Leaves up to 1 ft. in length, broadly cordate, finely pubescent. Inflorescence a subaxillary cyme; flowers fragrant pale flesh colour. Fruit ovoid 2–2½ in. long, about 2 in. through, green or purplish changing to yellowish-red or pale orange.

Ill.—Cav. Ic. t. 524 (*Solanum betaceum*); Andrews, Bot. Rep. t. 511; Rev. Hort. 1880, p. 150; 1881, p. 470; Gard. Chron., March 19th, 1887, p. 383; Kew Bull. No. 8, 1887, p. 3.

Tree Tomato, Plum Tomato, Tomato de la Paz, Vegetable Mercury.

Native of Peru. Cultivated in East Africa, West Indies, S. Europe, etc.

Fruit edible, may be eaten raw or cooked like ordinary tomato, or makes a good preserve and jelly. As a conserve stewed with sugar it much resembles apple or apricot (Morris, Herb. Kew).

Succeeds at an elevation of 3000 ft. and upwards; mean annual temperature of 63°F.; in fruit all the year round and easily cultivated from seed; the trees begin to bear fruit in a year or less and may continue bearing for 10 years or more. The fruits, which take from 5–6 months to ripen from the time of flowering, should be quite ripe before gathering (Kew Bull. 1888, p. 179).

Ref.—"Tree Tomato (*Cyphomandra betacea*)," in Kew Bull. No. 8, Aug. 1887, pp. 2–6.

Withania, Pauq.

Withania somnifera, *Dunal*; Fl. Trop. Afr. IV. Sect. 2, p. 249.

Ill.—Wight, Ic. Pl. Ind. Or. iii. t. 853 (*Physalis somnifera*, var. *flexuosa*).

Vernac. names.—Sim el Far (Arabic, *Bromfield*); Asgandh or Asgundh (Indore, India, *Watt*, *Dymock*, *Biscoe*).—Rats-bane (*Bromfield*).

Katagum, Kuka, near Lake Chad, Bornu, and widely distributed in Tropical Africa, extending to S. Africa, India, Arabia, Persia, Canary Islands and the Mediterranean region.

The berries as with those of *W. coagulans* are used for coagulating milk into curd or cheese (Kew Bull. 1903 p. 27); in chest complaints and for ringworm, S. Africa (Pharm. Journ. [4] xxv. 1907, p. 133); the leaves and roots are used for various medicinal purposes in India (Watt, Dymock, *seq.*).

An erect shrubby plant 2–4 ft. high; usually found in comparatively dry regions; in bushy sandy submaritime places at the river Cavaco, Benguella, and in sandy thickets, banks of the river Bero, Mossamedes (Hiern, Cat. Welw. Afr. Pl. iii. p. 752); in flower and fruit in July (l.c.); in banana gardens, Buddu, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 52).

Ref.—"*Withania somnifera,*" in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 566–569.——"*Withania somnifera,*" in Dict. Econ. Prod. India, Watt, vi. part IV. 1893, pp. 311–312.——"Vegetable. Rennets," in Kew Bull. 1903, pp. 27–28.——"*Withania somnifera,*" Biscoe, in Indian Forester, xxxvii. 1911, pp. 380–381.

Capsicum, Linn.

Capsicum annuum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 251.

Ill.—Rheede, Hort. Mal. ix. t. 35; Knoor, Thesaurus, Herb. Hort. ii. t. c. 6; Gaertner, Fruct. Sem. Pl. ii. t. 132; Plenck, Ic. t. 107; Schk. Handb. t. 47; Hayne, Darst. Beschr. Gewächse, x. t. 24; Desc. Ant. vi. t. 422; Nees von Esenbeck, Plant. Medic. Düsseld. t. 190; Guimpel, Abbild. Beschr. t. 16; Woodville, Med. Bot. ii (1832), t. 80; Fingerhuth, Monogr. Capsici, t. 2 (vars. *rugulosum, acuminatum, subangulosum, ovoideum, abbreviatum, olivaeforme*); Burnett, Pl. Util. i. t. 14 b; Good, Fam. Flor. t. 32; Berg. and Schmidt, Darst. and Beschr. Pharm. iii. t. 20 a (*C. longum*); Rchb. Ic. Fl. Germ. xx. t. 1634, f. 2; Bentl. and Trimen, Med. Pl. t. 189; Köhler, Med. Pflan. i.; Greshoff, Nutt.

Ind. Pl. t. 47; Irish, 9th Report, Missouri Bot. Gdn. 1898, tt. 8–28.

Vernac. names.—Ata jije (Lagos, *Dawodu*); Berkomo or Barkom (Hausa, *Parsons*); Bembe (Sierra Leone, *Scott Elliot*); Busbas (Hadramaut, *Lunt*); Pimiento (Porto Rico, *Cook* and *Collins*).

Annual Capsicum or Pepper, Red Pepper, Guinea Pepper.

Widely distributed in the Tropics of the Old and New Worlds.

Capsicum baccatum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 252.

Ill.—Rumpf, Amb. v. t. 88, f. 2; Plenck, Ic. t. 108; Gilii and Xuarez, Rome, t. 23; Desc. Ant. vi. t. 423; Sloane, Hist. Jamaica, i. t. 146, f. 2; Fingerhuth, Monogr. Capsici, t. 4. f.a; Journ. Roy. Hort. Soc. xxxv. p. 368.

Vernac. names.—Comorim (Ambriz, *Welwitsch*); Aji picante (Porto Rico, *Cook* and *Collins*).—Bird Pepper, Berry Capsicum.

Native of the East and West Indies; in Tropical Africa specimens are recorded only from Uganda and Angola.

Uses much as under *C. annuum*; forms the principal ingredient in the preparation "mandram" of the West Indies.

Cultivated in Ambriz, S. W. Africa (Hiern, Cat. Welw. Afr. Pl. iii. p. 751) in Botanic Gardens, Entebbe (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 53).

Has been grown in the gardens of this country since 1713, easily cultivated, for particulars and references, see end of genus.

Capsicum frutescens, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 251.

Ill.—Rheede, Hort. Mal. ii. t. 56; Rumpf, Amb. v. t. 88, ff. 1, 3, 4; Lam. Encycl. t. 116; Gilii and Xuarez, Rome, t. 22; Fingerhuth, Monogr. Capsici, t. 4, f. c; Duthie, Field Crops, t. 74; Bentl. & Trimen, Med. Pl. t. 188 (*C. fastigiatum*); Journ. Roy. Hort. Soc. xxxv. p. 368.

Vernac. names.—Ata-Eiye Sisebe; Ata Gbasejo (Oloke-Meji, *Dodd*); Niamako, Gouengbe (French Guinea, *Pobeguin*); Ata jije nla (Lagos, *Dawodu*); Aji (Porto Rico, *Cook* and *Collins*); Sakay filo (Madagascar, *Parker*); Boro ni papalagi (Fiji, *Seemann*).—Shrubby Capsicum, Spur Pepper, Bird Pepper, Guinea Pepper, "Chillies" of Commerce.

Common throughout all tropical countries.

Uses similar to those of *C. annuum*, the dried ripe fruits come into this country from Zanzibar, Nyasaland, Japan. This species is the one principally used for making "Cayenne" pepper.

The Capsicums generally are used chiefly as condiments, in medicine, and some of the larger and milder fruits as a vegetable stuffed with meat and baked or eaten raw as a salad. There are also several special preparations such as "Cayenne pepper" made by grinding the ripe dried fruits to powder—more especially those of the smaller pungent varieties, as *C. frutescens*—sometimes made up into cakes with wheat flour and yeast, baked and again ground and sifted ("Cayenne Pepper Pot"). "Mandram" is

a West Indian stomachic prepared by washing a few pods of bird pepper and mixing them with sliced cucumbers and shallots with the addition of lime juice and Madeira wine (Irish, *seq.*). "Curry Powder (with Turmeric) and various brands of Pepper Sauce," including "Tabasco" (Mexican). "Paprika" is a Hungarian condiment made by grinding the fruits after removal of the seeds. Capsicums find a use in mineral water manufacture and the seeds are used for feeding birds.

An extensive trade is done in the fruits under the names "Capsicums" and Chillies, the former name being broadly used for the larger fruits and the latter name for the smaller fruits, sometimes also called "Bird Pepper." The value may fluctuate between 35s.–50s. per cwt., anything below 35s. would perhaps hardly pay collecting. Zanzibar Chillies have been known to fetch 140s. per cwt. (Kew Bull. 1892, p. 88), Sierra Leone Chillies in Liverpool (April 1915) realised 88s.–89s. per cwt.

The principal sources of supply are Zanzibar, Uganda, Nyasaland, B.E. Africa, Sierra Leone, Natal, India, Japan, and the West Indies, the total trade approximating to 100 tons a year. India alone with a total trade of about 5000 tons in 1907, contributed to the United Kingdom nearly 35 tons (Watt Comm. Prod. India, p. 268). Sierra Leone in the same year exported 33 tons, and in 1909–10 Nyasaland exported about 53 tons (Ann. Rep. Agric. and For. Dept., Nyasaland, 1910, p. 9).

The cultivation is easy and much the same as given under *Solanum melongena*. In the cooler countries they are treated as annuals, but in the Tropics some forms may be biennial or perennial. A light loamy soil is suitable, the crop comes to maturity in from 4–7 months from sowing. Sown periodically, fruits may be kept in season the year round. A good crop would be from 4000–8000 lb. per acre fresh or 1000–2000 lb. when dry. The only preparation required, is picking when just about to change colour, and drying in the sun. Clean, bright fruits are essential for shipment. In drying, the fruits lose considerably in weight. Watt (Comm. Prod. India, p. 267) states that dry chillies are only about $\frac{1}{4}$ the weight when green. There are upwards of 150 varieties, chiefly of *C. annuum* under cultivation, including those with small, pungent, and large, mild or "Sweet." Amongst the pungent varieties may be mentioned "Nepal," "Tabasco," etc., and of the mild, "Bell," "Sweet Mountain," "Ruby King," "Mammoth Golden Queen," "Chinese Giant," "Paprika," etc.

Peppers are grown throughout Nigeria chiefly as a mixed crop near houses or on farms, and according to Dudgeon (Agric. and For. Prod. W. Afr. p. 135) in Kano and Zaria they are grown in irrigated fields. They form one of the indispensable crops for local use throughout the Tropics.

Ref.—"*Capsicum fastigiatum* and *Capsicum annuum*," in Med. Pl. Bentley and Trimen, Nos. 188, 189, 8 pp. (Churchill, London,

1880).——"Sweet Cayenne Pepper (*Capsicum annuum* var.)" in New Comm. Pl. and. Drugs, Christy, No. 4, 1881, pp. 15–17.——"*Capsicum annuum*," in Med. Pflanzen, Köhler, i. 4 pp.——"Fructus Capsici," in Pharmacographia, Flückiger and Hanbury, pp. 452–455.——"Capsicum," in Dict. Econ. Prod. India, Watt, ii. 1889, pp. 134–140, *C. annuum, frutescens, grossum, minimum*.——"*Capsicum annuum*," in Nuttige Indische Planten, Greshoff, pp. 213–218 (J. H. De Bussy, Amsterdam, 1894).——"Chillies," in Kew Bull. 1898, pp. 171–175.——"A Revision of the genus *Capsicum*," Irish, in Report No. 9, 1898, Missouri Botanical Garden, pp. 53–110; plates 8–28 (Wesley and Son, London).——"A List of American Varieties of Peppers," Tracey, U.S. Dept. Agric. Bureau of Plant Industry, Bull. No. 6, 1902, pp. 1–19, and in Bull. No. 21, 1903, pp. 294–300.——"A Note on Chili Cultivation," Drieberg, in Trop. Agric. xxiv. 1905, pp. 177–179.——"Chillies or Capsicums," Buttenshaw, in West Indian Bull. vii. No. 3, 1906, pp. 213–221.——"Capsicum," in Comm. Prod. India, Watt, pp. 264–269 (John Murray, London, 1908).——"Chillies," in Bull. Imp. Inst. vii. 1909, pp. 45–46.——"Cayenne Pods from Rhodesia and the Gold Coast," l.c. x. 1912, pp. 571–572.——"Capsicums," in Spices, Ridley, pp. 360–383 (Macmillan and Co. Ltd. London, 1912).——"Sweet or Non-Pungent Cayenne Pepper," Holmes, in Pharm. Journ. [4] xxxvi. 1913, pp. 626–627.——"Capsicums," in The Perfumery and Essential Oil Record, v. May 1914, pp. 145–146.

Datura, Linn.

Datura fastuosa, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 256.

Ill.—Rumpf, Amb. v. t. 87; Blanco, Fl. Filip. t. 35; Wight, Ic. Pl. Ind. Or. iv. t. 1396; Wight, Illust. t. 166 bis. f. 1; Fl. des Serres, xiv. 1861, t. 1457 (fl. pl.); Gartenfl. xxii. 1873, p. 217; Journ. Bombay N.H. Soc. xiv. t. U; Bailey, Pois. Pl. Queensland, p. 127, f. 218.

Vernac. names.—Jila-Andundo (Golungo Alto, *Welwitsch*); Mutumbella (Mossamedes, *Welwitsch*); Estramonio (Porto Rico, *Cook* and *Collins*).—Black Datura.

Cosmopolitan in the Tropics; the var. *alba* is recorded from the West Coast of Africa.

Leaves boiled in beer to give it a stupefying quality, Shire Highland (Buchanan, Herb. Kew). Used as a narcotic to drug palm-wine, in Golungo Alto, where in case of a robbery the negroes use a mixture of the pounded leaves and palm-wine—which produces, when drunk, a condition bordering on madness—to discover the thief (Hiern, Cat. Welw. Afr. Pl. iii. p. 753). In general the properties are much the same as those of *D. Stramonium*. The var. *alba* is said to be most highly approved for medicinal purposes in India (Watt, Comm. Prod. India, p. 488). In experiments with plants grown in India, the total alkaloid has been found to vary from 0·1 in the roots to 0·2 in the

fruits, and scopolamine was found to be the predominant alkaloid (Ann. Rep. Bd. Sci. Advice, India, 1911–12, p. 23).

An erect annual plant 3–5 ft. high, with large handsome flowers, white inside, violet outside in the type, all white in the var. *alba*, less foetid than the leaves. Cultivated at the Botanic Station, Ebute Metta, in flower and fruit in June (McNair, Report Bot. St. Ebute Metta, June 30, 1889); found in cultivated plots and neglected fields, more or less solitary, in flower and fruit end of July, Loanda, about native dwellings on rubbish heaps, in flower and fruit February, Golungo Alto and on maritime sands of Cazenga island where it is wild and abundant, the shining violet colour of the stems and leaves ornamenting the very white sands, especially when the no less abundant *Tribulus terrestris* is also present with its large golden yellow flowers (Hiern, Cat. Welw. Afr. Pl. iii. p. 753).

Ref.—"Semen et Folia Daturae Albae," in Pharmacographia, Flückiger and Hanbury, pp. 462–463.——"*Datura fastuosa*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 32–39.

Datura Metel, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 256.

Ill.—Bot. Mag. t. 1440; Blanco, Fl. Filip. t. 34; Sweet, Brit. Fl. Gard. vii. (1838) t. 380 (*D. guayaquilensis*); Wight, Ic. Pl. Ind. Or. iii. t. 852 (*D. alba*).

Vernac. names.—Zakami (Katagum, *Dalziel*); Chamico Blanco (Porto Rico, *Cook* and *Collins*).—Guayaquil Thorn Apple, Downy Thorn Apple, Egyptian Henbane.

Cosmopolitan in the Tropics.

A poison, Katagum (Dalziel, Herb. Kew). The seeds and leaves have been found to contain 0·25 and the capsules 0·12 per cent. of total alkaloid, in Indian grown plants (Ann. Rep. Bd. Sci. Advice, India, 1911–12, p. 23). Uses similar to those of *D. Stramonium*. The seeds contain about 15 per cent. of oil (Hooper, Agric. Ledger, No. 5, 1911–12, "Oils and Fats of India," p. 156).

A herbaceous plant, stem erect, 3–4 ft. high, found growing near villages, Katagum (Dalziel, l.c.); apparently wild, in waste ground by the river Niger, Farana (Scott Elliot, Herb. Kew); cultivated throughout Mexico (Dolley, Encl. in Letter H.M. Consul, Mexico, April 1910, to Director Kew). Cultivation same as for *D. Stramonium*.

Ref.—"*Datura Metel*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 39–40.——"*Datura Metel*," in Pharmacographia Indica, Dymock, Warden and Hooper, ii. pp. 585–592.

Datura Stramonium, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 257.

Ill.—Oeder, Fl. Danica. iii. t. 436; Plenck, Ic. t. 96; Sowerby and Smith, Eng. Bot. xviii. t. 1288; Schk. Handb. t. 43; Palmstruck, Svensk. Bot. Stockholm, i. t. 43; Hayne, Darst. Beschr. Gewächse, iv. t. 7; Curtis, Fl. Lond. (Graves Ed.) i. t. 55; Lam. Encycl. t. 113; Bigelow, Amer. Med. Bot. t. 1; Desc. Ant. iii. t. 173; Nees von Esenbeck, Plant. Medic. Düsseld. t. 193; Guimpel, Abbild. Beschr. t. 45; Woodville, Med. Bot. ii. (1832) t. 74; Steph.

and Ch. Med. Bot. i. t. 6; Baxter, Brit. Bot. ii. t. 121; Zenker, Fl. Thuringen, ii. t. 217; Burnett, Pl. Util. ii. t. 43 a; Good, Fam. Flor. t. 56; Berg. and Schmidt, Darst. Beschr. Pharm. iii. t. 20 d; Syme, Eng. Bot. vi. Ed. 3, t. 835; Rchb. Ic. Fl. Germ. t. 1624, f. 1; Bentl. and Trimen, Med. Pl. t. 192; Kohler, Med. Pflanz. i.; Rev. Hort. 1910, p. 132; Henkel, U.S. Dept. Agric. Farmers' Bull. No. 188, 1904, ff. 26, 27; Bureau of Pl. Industry, Bull. No. 219, 1911, p. 30, f. 22.

Vernac. names.—Chamisco, Chamico Morado, Estramonio (Porto Rico, *Cook* and *Collins*).—Jimson Weed, Thorn Apple, Mad Apple, Devil's Apple, Smoke Apple-wort, Stink-wort, Stinkweed, David's-bush, Wildfire bush, Jamestown Lily, Apple of Peru, Fire-weed, etc., etc.

Kuka on Lake Chad; widely distributed in Tropical Africa and generally throughout the Tropics, and during long hot seasons in many temperate countries—Germany, Austria-Hungary, etc. In England it is grown at Long Melford, Suffolk.

The seeds contain 16 per cent and upwards of oil of feeble drying value (Hooper, Agric. Ledger, No. 5, 1911–12, "Oils and Fats of India, p. 156).

A poisonous though useful medicinal plant. The active and poisonous principle is "Daturin." Andrews finds the percentage of total alkaloid in the stems 0·25, in the leaves 0·41 and 0·45, and in the fruits 0·46—in this respect bearing favourable comparison with European and Egyptian plants—the alkaloid consisting of hyoscyamine, alone or associated with a small proportion of scopolamine (Ann. Rep. Bd. Sci. Advice, India, 1911–12 p. 23); contains the same alkaloids as Belladonna (*Atropa Belladonna*) and in nearly the same proportion (0·4 per cent.) (Pharm. Journ. [4] xviii. 1904, p. 328).

Smoking the leaves has been found beneficial for asthma, and "Stramonium" cigarettes or cigars have been sold for this purpose for many years. Syme (Eng. Bot. vi. 1866, p. 105) mentions this use, and Fuchs (De Hist. Stirp. etc. (1542) p. 691) mentions the name "Rauch Apfel-Kraut" or "Smoke Apple-wort," indicative of a similar use. It is probable that cigarettes recently sold in this country under the name "Fumastra," are made from the leaves of this and the above-mentioned species of *Datura.*

The Thorn Apple is cultivated in England, but it grows wild in Germany and Hungary whence supplies of the drug have come.

An annual of rank growth 1–2 ft. high in cool countries, 6–7 ft. high—very dark green leaves, white scented flowers, growing near water, Somaliland (Phillips, Herb. Kew), common throughout Uganda (Dawe, Rept. Bot. Miss Uganda, 1906, p. 53), cultivated throughout Mexico (Dolley, l.c.).

Propagated by seeds, about 10–15 lb. being required to sow an acre. May be sown in drills or planted out in rows about 2–3 ft. apart; the crop will be ready for cutting in from 3–4 months. The leaves should be collected at the time of flowering, the whole

plant being pulled up and the leaves stripped off and dried carefully in the shade. For seed the capsules may be collected when fully developed, though still green; they burst open in a few days on drying, when the seeds can be shaken out and dried. The dried leaves come into commerce at about ½d. per lb. or from £2 to £4 per ton; or 2½–8 cents per lb., United States (Henkel, U.S. Dept. Agric. Farmers' Bull. No. 188, 1904, p. 39), the value being enhanced at the present time (1914) by the war. "Semen Stramonii" are worth about 8d. per lb. wholesale price. The market value of the seeds (U. States) varies from 3–7 cents per lb. (Henkel, l.c. p. 38) but the demand is a limited one.

Ref.—"Herba Stramonii," and "Semen Stramonii" in Pharmacographia, Flückiger and Hanbury, pp. 459–461.——"*Datura Stramonium*," in Med. Pl. Bentley and Trimen, No. 192, 5 pp.——"*Datura Stramonium:* Thorn Apple," in New Comm. Pl. and Drugs, Christy. No. 10, 1887, p. 48.——"*Datura Stramonium*," in Dict. Econ. Prod. India, Watt, iii. 1890, pp. 40–43.——"*Datura Stramonium*," in Med. Pflan. Köhler, i. 2 pp.——"The Alkaloid of *Hyoscyamus muticus* and of *Datura Stramonium* grown in Egypt," Dunstan and Brown, in Tech. Rep. and Sci. Papers, Imp. Inst. II. 1903, pp. 38–39.——"Seeds of *Datura Stramonium* from India," in Bull. Imp. Inst. ii. 1904, pp. 224–225.——"Jimson Weed (*Datura Stramonium*)" in "Weeds Used in Medicine," Henkel, U.S. Dept. Agric. Farmers' Bull. No. 188, 1904, pp. 37–39.——"*Datura*," in Comm. Prod. India, Watt, pp. 487–489.——"Solanaceous Drugs from India," in Bull. Imp. Inst. ix. 1911, pp. 110–116—*D. Stramonium, D. fastuosa, D. Metel,* etc.——"The Active Constituents of the Indian Solanaceous Plants," *D. Stramonium, D. fastuosa,* and *D. Metel,* Andrews, in Journ. Chem. Soc. No. dlxxxix. (London, 1911) pp. 1871–1877, Abstract in Bull. Bur. Agric. Intell. Rome, Feb. 1912, pp. 399–400.——"Stinkblaar, Pomme épineuse: *Datura Stramonium*," in Bull. Agric. du Congo Belge, iii. 1912, "Symptômes d'Empoisonnement, Traitement," in L'Empoisonnement du Bétail par les plantes veneneuses en Afrique du Sud. p. 364.——"The Alkaloidal Content of Individual Plants of *Datura Stramonium* and *D. Tatula*," Miller and Meader, in The Lily Scientific Bulletin, Ser. 1, No. 3, June 20, 1913, pp. 108–111.—"Honey from *Datura Stramonium*," Deane, in Chemist and Druggist, July 26, 1913, p. 187.——"A Note on the Alleged Poisonous Properties of Honey from *Datura Stramonium*," Deane, in Pharm. Journ. [4] xxxvii. 1913, pp. 134–135.

Nicotiana, Linn.

Nicotiana glauca, *R. Grah.* in Edinb. N. Phil. Journ. (April-June, 1828) p. 175.

A glaucous shrub, branches erect, 11–20 ft. high. Leaves ovate or oblong acute or acuminate, glabrous, 3–5 in. long, 1½–3 in. broad. Inflorescence a terminal panicle; flowers tubular, yellow, covered with down.

Vernac. names.—[Carallanta (Bolivia), Palan-palan or Balan-balan (Argentina) Bathmartiger Tabak (German) *Comes*]—Trumpet Tree (Jerusalem, *Vester & Co.*).

Ill.—Bot. Mag. t. 2837; Sim, For. Fl. Cape Col. t. 115, f. 1.

Native of the Argentine, Bolivia and Paraguay. Naturalised in South Africa.

Grown as an ornamental plant at Onitsha (Dodd, List of Pl. Onitsha Plantations and Gardens, July, 1907). Sim (l.c. p. 279) states that the plant prefers soil or rock in which lime is present and that it has the reputation of being poisonous to stock.

It is a pest in N.S. Wales, Victoria and S. Africa.

Nicotiana rustica, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 260.

Ill.—Duthie, Field Crops, t. 17; Comes, Monogr. Nicotiana, t. 1, f. 2; Köhler, Med. Pflanz.

Vernac. name.—Guibili (Egypt, *Battcock*).—Turkish or East Indian Tobacco.

Mexico, California, Argentine, etc. Cultivated in India, Egypt, West Africa, and specimens have been collected in Kordofan, Simona, Sudan (Chevalier, No. 976, 1907, Herb. Kew), Khartum and Nile region (Grant, Herb. Kew), Madi Country (Dawe, No. 871, 1905, Herb. Kew) and B.E. Africa.

The Tobacco of Khartum and the Nile (Grant), cultivated in Nile region growing 1–2 ft. (Dawe l.c.), and according to Chevalier (Bull. Soc. Nat. d'Accl. France, 1912, p. 138) it is the species principally cultivated in the Sudanese region and it forms an important trade in French Guinea, the valley of the Middle Niger (French Sudan) and Northern Nigeria. The var. **brasilia** *Schrank*, "fumo-crespo" of the Brazilians, native of Brazil, is used in the manufacture of snuff, and var. **humilis**, *Schrank*, is extensively cultivated for the same purpose.

Ref.—"*Nicotiana rustica*: Turkish or East Indian Tobacco," in Dict. Econ. Prod. India, Watt, v. part. 1, 1891, p. 352.——"*Nicotiana rustica*," in Comm. Prod. India, Watt, p. 794–795.——Studies in Indian Tobaccos: The Types of *Nicotiana rustica*: Yellow Flowered Tobacco, Howard and Howard, Memoirs (Bot. Series) Dept. Agric. India iii. No. 1, March 1910, pp. 1–58, plates i.–xxv.

Nicotiana Tabacum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 259.

Ill.—Gaertner, Fruct. Sem. Pl. i. t. 55; Lam. Encycl. t. 113; Buchoz, Herb. Col. Amérique, t. 96; Plenck, Ic. t. 99; Velloso, Fl. Alogr. Brazil, p. 215; Bilberg, Ekonom. Bot. t. 12; Schk. Handb. t. 44; Bigelow, Amer. Med. Bot. t. 40; Nees von Esenbeck Plant. Medic. Düsseld. t. 194; Wagner, Pharm. Med. Bot. t. 101; Desc. Ant. vi. t. 413; Hayne, Darst. Beschr. Gewäche, xii. t. 41; Guimpel, Abbild. Beschr. t. 105; Steph. and Ch. Med. Bot. t. 37; Blanco, Fl. Filip. t. 36 (var. *macrophylla*); Burnett, Pl. Util. i. t. 1a; Good, Fam. Flor. t. 84; Wight, Illust. t. 166 bis, f. 2; Nees von Esenbeck, Gen. Plant. Fl. Germ. v. t. 52; Berg and Schmidt,

Darst. and Beschr. Pharm. ii. t. 12d; Rchb. Ic. Fl. Germ. t. 1625, ff. 1, 2 (var *macrophyllum*), f. 3 (var. *attenuatum*); Bot. Mag. t. 6207 (var. *fruticosa*); Bentl. and Trimen Med. Pl. t. 191; Köhler, Med. Pflanz. iii; Duthie, Field Crops, t. 16; Zippel, Ausl. Handels. Nährpfl. t. 4; Comes, Monogr. Nicotiana, 1, tt. 3–8 (including var. *fruticosa, lancifolia, virginica, brasilensis, havanensis, macrophylla*); Le Jardin, 1907, p. 361.

Vernac. names.—Tabba (Nupe, Borgu, *Barter*); Bobi (Manga, N. Nigeria, *Dudgeon*); Ewa Taba (Lagos, *Dawodu*); Tambac (Hadramaut, *Lunt*); Phodia (River Shire, *Meller*).

Nupe (Barter, No. 1345, Herb. Kew); Manga, N. Nigeria (Dudgeon, No. 60, 1907, Herb. Kew) and more or less throughout Nigeria. Native of Tropical America and widely cultivated.

The flowers are used in Northern Nigeria by the natives to stain the teeth red (Dudgeon l.c.). It is grown as an irrigated crop together with "Gorrko" chiefly for the flowers ("furé"); at Uje the total yield of tobacco and flower per plant is valued at 10 ratals (2d.), at Zoroto, 12 ratals, and in some places the flower is of no local value. At Alo a characteristic tobacco plot measuring 112 square yards contained 209 tobacco plants and 131 "Gorrko" plants (Thomson, N. Nig. Gaz. 15th July, 1912, Suppl. p. 22), but larger plots as at Merguba, containing 2000 and upwards of tobacco plants with about 200 "Gorrko" plants are sometimes grown.

The seed contains a greenish-yellow oil, yielding by pressure 9–10 per cent. and by extraction 30–32 per cent., with strong drying powers (Hooper, Agric. Ledger, No. 5, 1911–12, p. 157).

Nicotine is an alkaloid extracted from the refuse of tobacco factories, principally the midribs of the leaves; those of the "Virginian" and "Kentucky" varieties being regarded as the best for the purpose. It is an important horticultural insecticide, and the principal constituent of some sheep-dips. It is produced in the manufactories of this country under the supervision of the Inland Revenue Department, the officials also certifying to the burning of the marc which the regulations demand. Commercial samples must contain not less than 90 per cent. of pure Nicotine. In addition to that produced under bond there is a certain amount imported (see The Chemist and Druggist, Nov. 9th, 1907, p. 723).

Experiments made in France go to show that the cultivation of Tobacco entirely for the production of Nicotine would not be profitable. The varieties grown were "Auriac" and "Nykerka," and the best results were obtained by leaving 6 leaves per plant with 20,000 plants to the hectare and fertilising with 300 kilog. of sodium nitrate per hectare, but this plot yielded only 156 kilog. of Nicotine (Bull. Bur. Agric. Intellig. Rome, Jan. 1911, p. 107). In every case it was found that the quantity of Nicotine was considerably reduced when all the leaves were left on the plants and the soil was unmanured (l.c. Nov. 1910, p. 74).

Snuff and "Tobacco Powder Insecticide" is also manufactured from the refuse of tobacco manufactories.

The uses of tobacco for smoking, chewing and as snuff need scarcely be mentioned since it is perhaps the most widely spread luxury in the world. The total trade in the course of a year amounts to more than 2,000,000,000 lb., and the revenue value to this country alone amounts to more than £15,000,000 (over £17,000,000 in 1913) annually.

The principal source of supply to this country of unmanufactured tobacco is the United States from whence in 1913 the United Kingdom imported 142,042,656 lb. value £5,657,546. The total imports for the year from all sources amounted to 162,365,925 lb. value £6,709,082; the countries contributing over a million pounds of the difference were:—The Netherlands (6,450,867 lb. value £287,493), Turkey (6,247,102 lb. value £429,756), Germany (2,678,385 lb. value £180,620), Nyasaland (1,901,851 lb. value £55,733) and Portuguese East Africa (1,570,477 lb. value £39,193) (Trade of the United Kingdom, i. 1914, p. 244).

Several well marked varieties are distinguished by Comes [Monographie du Genre Nicotiana (1899); Delle Razze dei Tabacchi: Filogenesi, Qualita ed Uso (1905)] from which have arisen numerous races, cultivated forms, or hybrids, each of these being here referred to under the predominating parent plant.

var. **brasiliensis**, *Comes*, Monogr. Nicot. p. 14, tt. 1, 6; Delle Razze, p. 19, f. 3, p. 79.

Broad-leaf Tobacco. Native of Brazil, Venezuela, Bolivia. Cultivated—United States, including Brazilian, Florida, Maryland, Ohio, Missouri, Marylander Big Frederick, Marygold, Sterling, Tennessee Red, Ruffled Leaf, Landreth, Granville County Yellow, and Evans (or Cinnamon Scented); Canada, Brazil, Paraguay, Argentina, Porto Rico, Chili, France, Germany, Italy, Turkey—Adrianopoli, Saloniki, Herzegovina; Africa—Algeria, Cape, Uganda, Nubia.

var. **fruticosa**, *Comes*, Monogr. Nicot. p. 9, tt. 1, 3; Delle Razze, p. 15, f. 1, p. 27.

Narrow-leaved or Shrubby Tobacco. Native of Mexico and Brazil; including certain tobaccos from Venezuela—Carabobo; Japan, China—Hainan; Nepal, Java, Singapore, Africa—Egyptian Sudan (Sennaar), and Turkey—Latakia, Samsun, Bafira.

var. **havanensis**, *Comes*, Monogr. Nicot. p. 16, tt. 1, 7; Delle Razze, p. 22, f. 5, p. 153.

Havana Tobacco. Native of Mexico. Cultivated—United States including the "seed-leaf" types of Connecticut, Pennsylvania, Ohio, Maryland, Missouri, Florida and Havana, Wilson's Hybrid, General Grand, the Spanish types of Zimmer, Little Dutch, Comstock, etc., and tobaccos of Mexico, Honduras, Manila, Java—Besoeki, Kadoe, Kedirie, etc., Sumatra—Deli, Rano; Cochin China—Saigon; Persia, Aya-Soluk and Greece.

var. **lancifolia**, *Comes*, Monogr. Nicot. p. 11, tt. 1, 4; Delle Razze, p. 18, f. 2, p. 51.

Sword-leaf Tobacco. Native of Ecuador and Colombia. Cultivated—United States, including Kentucky, Red Burley, White Burley, Climax; Syria—Latakia; Greece, Italy, France, Germany, India, and S. Domingo Tobacco.

var. **macrophylla**, *Comes*, Monogr. Nicot. p. 18, tt. 1, 8; Delle Razze, p. 24, f. 6, p. 199.

Large-leaved Tobacco. Native of Mexico. Introduced to Porto Rico, Brazil, Peru, India, Persia, Egypt, Abyssinia, Zambesi and a source of the tobaccos of Cuba—Yara; Venezuela—Varinas; Macedonia (Turkish)—Yaka, Xanthi Yakà, Jenidjé-Yakà, Makalla, Cavalla (Kawala), Salonika, etc., and Greece—Argos, Sari.

var. **virginica** *Comes*, Monogr. Nicot. p. 12, tt. 1, 5; Delle Razze, p. 21, f. 4 p. 121.

Virginia Tobacco. Believed to be a native of the Orinoco Region. Cultivated—United States, including Virginia Bright, Orinoco (Big, Sweet or Little, Yellow, White Stem), Goock, Prior (Best, Blue Medley, Yellow), Yellow Mammoth, Kentucky Yellow, Golden Leaf, Gold Finder, Hester, One Sucker, Conqueror, etc.

The commercial grades are pipe and cigarette tobaccos (see var. *virginica* and *macrophylla*, chiefly), Virginia, Kentucky, Maryland, etc. Eastern—Turkish, Bulgarian, Greece, etc., and cigar tobaccos (see var. *havanensis*, comprising most or all of those recommended), including "wrappers," "binders," and "fillers," from Java, Borneo, Sumatra, Havana, Mexico, Manila, Brazil, and Esmeralda (Venezuela), and "Cavendish" or "Negro Head."

Pipe Tobaccos are sometimes distinguished as "brights"; "Latakia" is cured by smoking with the green wood of "Oak" (*Quercus Robur*); it is in favour for smoking mixtures. "Cavendish" is a general term for all kinds of Cake or "Plug" Tobaccos made chiefly from Virginia Types and Kentucky "Red Burley," especially the darker kinds, the lighter coloured tablets and those of finer quality being called "Honeydew." The home of the manufacture of Cavendish is Richmond, Virginia; and in the Kew Museum a very fine sample may be seen made there in 1860. In the Customs Returns it is given as "Cavendish" or "Negro Head" of which in 1913 the imports from the United States were 1,144,605 lb. value £53,386. The comparatively small amount of 8340 lb. value £847 which made up the total of this kind from all sources, included Norway, Germany, Netherlands, France, Brazil, S. Africa, B. India, Canada and other British Possessions (Trade of the United Kingdom, i. 1914, p. 242). The native grown tobaccos are too coarse and inferior for export purposes though a large trade may be done in them locally. In parts of Africa—Rhodesia, Nyasaland, B.E. Africa, South Africa, etc., where a product fit for export has been successfully grown the varieties have been one or other of those mentioned above, and similarly for Jamaica, B. N. Borneo, Hong Kong, Australia, Canada, and other Colonies. The first trial shipments

from Nyasaland in 1907 was grown partly from Kentucky and partly from bright Virginia seed (Report, W. O. Müller and Co., London, 1st Jan. 1908). "Turkish," "Virginia," "Kentucky," and "Maryland" Tobaccos are under experiment at Onitsha, S. Provinces (Col. Rep. Misc. No. 51, 1908, pp. 79, 80), where Virginia Tobacco had previously been grown with success and sold locally to the natives (Col. Rep. Ann. No. 512, 1906, p. 26). This variety has also been grown with promising success by the Roman Catholic Mission, Muri Province (Col. Rep. Ann. No. 633, 1910, p. 25). Manila and Sumatra varieties are being tried at Lokoja, N. Provinces (Col. Rep. Ann. l.c. p. 8; N. Nig. Gaz. 30th April, 1910, p. 93).

A sample of tobacco grown at Owerri, S. Provinces was sent to Kew by the late Mr. J. W. Sherriff of the Forestry Dept. in 1906; it was reported on by Messrs. W. O. Müller and Co. who stated that if properly fermented, assorted and packed it would have a value either for cigar purposes or as a blend with American Smoking Tobaccos of about 5d.–8d. per lb. in bond. They suggested it was raised from "Cuba" or "Cuba-Canary" Seed; it was similar to that of Canary (Teneriffe) and to the tobacco raised in recent years on a small scale in the Cameroons (Bibundi) and these Canary and West African tobaccos had so far not attracted much attention in the European markets (Mus. Kew). Samples have also been reported on from Kano—a coarse type unsuited to the European market (N. Nig. Gaz. 30th June, 1910, p. 147), Baro (Col. Rep. Ann. No. 674, 1911, Suppl.) and Ibadan (Col. Rep. Ann. No. 630, 1909, p. 40; S. Nig. Govt. Gaz. March 3rd, 1909, Suppl. p. 6) at the Imperial Institute. The leaves from Baro were of good shape and texture but rather thin for pipe tobacco, and the latter (two samples) though not showing saleable qualities for Europeans indicated that tobacco of good quality could probably be grown at Ibadan and that it would be worth while to cultivate it under expert supervision; both samples on analysis showed a similar composition to the pipe tobaccos of commerce containing (1) Moisture 6·39 per cent., Nicotine 1·46, Ash 18·65, Total Nitrogen 3·34 per cent., and (2) Moisture 10·46, Nicotine 3·48, Ash 13·95, Total Nitrogen 4·14. The high percentage of total nitrogen indicated under fermentation.

In the United States the various types of leaf possessing well-defined characters suitable for the particular requirements of the trade are established in recognised areas, and the merits of a new variety from any new area cultivated, and more especially from a new country, would have to be thoroughly proved before being accepted by the manufacturers.

Tobacco is invariably raised from seed. This is very fine (about 300,000 or more to the ounce) and as usual with very small seeds requires great care in sowing. About 1 oz. could be used to sow a bed 10 ft. square, and to admit of an even distribution the seed may be mixed with sand or wood ashes in the proportion of about half and half or one of seed to two or more of the medium.

A tablespoonful of seed sufficient to sow about 1 sq. rod is recommended (U.S. Dept. Agric. Farmers' Bull. No. 416, 1910, p. 10) to be stirred into a 2 gallon watering can of water which is sprinkled evenly on the bed. Only specially selected seed should be used, and a good surplus sown at intervals of 2 weeks or so to allow for losses. When large enough to handle they may be thinned out or pricked off in specially prepared beds of light rich soil, a few inches apart, and transplanted to the field when about 3 or 4 inches high or about 6–8 weeks old. They are put in at distances of about 18–24 in. from each other in rows 3 ft. apart. From the time of sowing in the nursery until established in the field judicious shading will be required together with a continual look out for insect pests and fungus diseases, "damping off" in the seedling stage, etc. At a certain stage (when about a foot high, or at the latest as soon as they show signs of flowering) the plants should be topped and all side shoots removed as they appear, a few selected plants being allowed to flower and seed.

In preparing the plantation as much care is necessary as recommended for indigo (p. 193) in manuring, ploughing, harrowing, weeding and thorough tillage. For manure artificial fertilisers—potash, nitrogen and phosphates; goat-dung, cow manure, 10 or 20 tons per acre, or ploughing in of some leguminous plant is recommended (see p. 179, Leguminosae); "Russian" or "Hairy Vetch" (*Vicia villosa*) a plant found to be resistant to cold, heat and drought and decaying rapidly when turned under, has been introduced as a cover crop on tobacco lands in Connecticut, but artificial inoculation was necessary to make it valuable for the purpose (Robinson, U.S. Dept. Agric. Bur. Pl. Industry, Circ. No. 15, 1908, pp. 1–5). A light sandy loam rich in potash and humus is important, and soils are commonly burnt over before sowing or planting to destroy insects, at the same time the burning gives a good supply of potash in the plant and wood ashes.

The leaves are ready for harvesting in from 80–90 days after transplanting, indicated by a tendency to yellowing, and snapping readily like coca leaves (see p. 118) when folded, though it is only by experience that the right time to a nicety can be judged. They are conveyed without delay to sheds specially constructed for drying or curing, strung carefully on slats, air and moisture being regulated to prevent drying too quickly, the time occupied may be 3–4 weeks. In some instances special heating flues are fitted in the drying barns, which facilitates drying on a large scale in any weather, the temperature (80° F.–120° F.) and humidity of these barns being regulated to a degree. Fire-curing is also sometimes practised in certain parts of Kentucky, Tennessee and Virginia, producing a dark and distinct flavoured leaf with the smoke of the open fires. They are afterwards fermented by placing them in carefully placed heaps several feet at least high, the temperature being gradually allowed to reach 100° F. or thereabouts, frequent examinations and repiling being made meanwhile to prevent moulding or overheating, the whole occupying perhaps from

4–6 weeks. Sorting and grading and baling complete the preparation. It may happen that the planter would finish with the produce after curing, the fermenting, sorting and grading and baling, if for export, being done by the leaf buyers.

In Yola planted July-September, the leaves ripen in the dry season; they are first dried in the sun, then pounded and mixed with water and made into cakes (Shaw, N. Nig. Gaz. Feb. 28th, 1910, p. 32).

A good crop may be from 1000–1600 lb. of finished leaf per acre. The price in bond may be from about 6d. to 1s. 6d. according to the quality. The regulations provide for a variation in the duty according to the amount of moisture—3s. 8d. the lb. for "unstripped" or "unstemmed," containing 10 lb. or more of moisture, 4s. 1d. per lb. containing less than 10 lb. of moisture in every 100 lb., and approximately the same ($\frac{1}{2}$d. more in each case per lb.) for "stripped" or "stemmed" tobacco.

Growing tobacco under shade—cheese cloth, light tiffany, or wood slats—has been found to improve the production of leaves suitable for cigar wrappers, and the high prices usually obtained for this grade of tobacco favours the system, but the intensive cultivation required makes the production more costly. The method has been practised with success in Florida, Georgia, Connecticut, Jamaica, etc., the Cuban and Sumatra kinds being specially adapted to it.

The above details are only general, as the cultivation like that of indigo and cotton requires expert supervision from beginning to end. The literature is extensive and the following references are confined to books and special bulletins.

Ref.—Report from the Select Committee on the Growth and Cultivation of Tobacco [within the United Kingdom] pp. 1–138 (ordered by the House Commons to be printed 21 June 1830).——Tobacco: Its History, Cultivation, Manufacture and Adulterations, Steinmetz, pp. 1–174 (Richard Bentley, London, 1857).——Tobacco and Its Adulterations, Prescott (Inland Revenue Dept.) pp. 1–130, illustrated (London, 1858).——Report on the Cultivation and Preparation of Tobacco in India, Watson, pp. 1–59, plates i.–iii. (India Office, London, 1871).——Report on the Production of Tobacco in India, O'Connor, pp. 1–92, with Appendices on Cultivation in Florida, Ohio, Philippine Islands, Australia, Curing (Maryland), Cost and Profits (Calcutta, 1873).——Monographia Sui Tabacchi Della Sicilia, Alfonso, pp. 1–456 (Sicilia, 1875).——Tobacco: Its History and Associations, Fairholt, pp. 1–332, Illust. (Chatto and Windus, London, 1876).——Tobacco: Its Culture and The Curing of Its Leaf, Morris, pp. 1–52 (Govt. Printer, Sydney, 1877).——Tobacco Culture, by 14 Experienced Cultivators, United States, pp. 1–50, illust. (Orange Judd Co. New York, 1884).——English Tobacco Culture, Beale, pp. 1–118, illust. (E. Marlborough and Co. London, 1887).——The Chemistry of Tobacco, Bell (Laboratory, Somerset House), pp. 1–36 (1887).——Tobacco Culture, Espin, Bull. Misc.

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Schwenkia, Linn.

Schwenkia americana, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 260. *Ill.*—Gaertner, Fruct. Sem. Pl. iii. t. 214; Bonpland, Humboldt and Kunth, Nov. Gen. Sp. Pl. ii. t. 180.

Vernac. names.—Dandana (Sokoto, *Dalziel*); Ale Odan (Lagos, *Dawodu*).

Widely distributed in West and S. W. Africa from Senegambia to the Congo, and found also in Brazil.

The pounded plant is used as a fish poison (Dawodu, Herb. Kew).

A herbaceous plant, about 2 ft. high; in waste places, Sokoto (Dalziel, Herb. Kew); on dry plains, Accra (Brown, Herb. Kew).

Schwenkia hirta, *Klotzsch*; Fl. Trop. Afr. IV. Sect. 2, p. 261.

Vernac. name.—Casuanze (Loanda, *Welwitsch*).

Katagum, and known also from Sierra Leone, Salaga-Nile Land, Angola and Loanda, occurring in Brazil and Guiana.

The whole plant given in decoction is recommended for chest complaints, Loanda (Hiern, Cat. Welw. Afr. Pl. iii. p. 754).

An annual herb up to 2 ft. high: common in dry places, Katagum (Dalziel, Herb. Kew); very plentiful in pastures and in manioc plantations, in flower and fruit January and May, Loanda, in September Sierra Leone (Hiern, l.c.).

SCROPHULARIACEAE.

Lindernia, Allioni.

Lindernia diffusa, *Wettst.*; Fl. Trop. Afr. IV. Sect. 2, p. 338.

Widely distributed in Tropical Africa and Tropical America.

A very bitter Scrophularia used as an antidote for snake-bite, Colombia (Blake White, Herb. Kew), and as an emetic in S. America (Pharm. Journ. [3] ii. 1872, p. 849; Moloney, For. W. Afr. p. 396, *Vandellia diffusa*).

A procumbent annual, about 6 in. high, in dry sandy ground, moist and wet places and grassy bush.

Hydranthelium, H. B. & K.

Hydranthelium egense, *Poepp. & Endl.*; Fl. Trop. Afr. IV. Sect. 2, p. 351.

Ill.—Poeppig & Endlicher, Nov. Gen. Pl. Chil. Peruv. iii. t. 287.

Onitsha, also in the Congo, and in Tropical America.

A small creeping plant in the muddy margins of streams, Onitsha (Barter Herb. Kew).

Used as a diuretic and aperient by the Hindus and the juice of the leaves mixed with petroleum used for rheumatism, India (Moloney, For. W. Afr. p. 396).

Ref.—"*Herpestis Monniera*," in Dict. Econ. Prod. India, Watt. iv. 1890, pp. 225–226.

Scoparia, Linn.

Scoparia dulcis, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 354.

Ill.—Gaertner, Fruct. Sem. Pl. i. t. 53; Lam. Encycl. t. 85; Pal. de Beauv. Fl. Oware et Benin, ii. t. 115; Desc. Ant. ii. t. 106; Blanco, Fl. Filip. t. 19; Arkiv. For. Botanik, Upsala and Stockholm, vi. t. 1, ff. 2, 3, t. 8, f. 1.

Vernac. names.—Misinmisin-gogoro or Misimisi-gogoro (Lagos, *Foster, Dawodu*); Achilabri (Bonny, *Fagan*); Ndiyang (Eifik, *Holland*); Broom (Gambia, *Brown Lester*); Balai-doux, Herbe à Balai (French Guiana, *Heckel*); Herva dos Vassiros (Ambriz, *Welwitsch*); Pipybras (Liberia, *Holmes*); Mahè (Seychelles, *Thomasset*); Orozuz (Porto Rico, *Cook & Collins*).—Licorice Weed.

Widely distributed in Tropical Africa and in the Tropics generally.

The root chewed and used with tobacco juice for paralysing snakes, Old Calabar. The plant is used as forage for horses and oxen in the Congo (De Wildeman, Pl. Util. Congo (1905) p. 549): for gravel and kidney complaints, Liberia—a wineglassful of the decoction is taken cold three times a day, tea and coffee being forbidden during its use (Holmes, Pharm. Journ. [3] viii. 1878, p. 564); Moloney For. W. Afr. p. 397); included in "Agbo" (see p. 50), Lagos (Dawodu, Herb. Kew); used as children's medicine and as a diuretic, Sierra Leone (Scott Elliot, Herb. Kew; Oldfield, Mus. Kew); French Guinea (Pobéguin, in l'Agric. prat. pays chauds, xi. 2, 1911, p. 140); used for tussis, earache, and as a diuretic, Bonny, S. Nigeria (Fagan, 1903, Mus. Kew); and various medicinal uses are attributed to it in French Guiana (Heckel, in Ann. Inst. Col. Marseille, iv. 1897, p. 90); a remedy for coughs, Jamaica (Cook & Collins, Econ. Pl. Porto Rico, p. 236).

A slender shrub, 1–3 ft. high, a common weed everywhere.

Buchnera, Linn.

Buchnera leptostachya, *Benth.*; Fl. Trop. Afr. IV. Sect. 2, p. 394.

Ill.—Peters, Mozamb. t. 34 (*B. mossambicensis*).

Vernac. name.—Tambobo (Madagascar, *Heckel*).

Nupe, and in Senegambia, French Guinea, B.E. Africa and Mozambique.

Used by the Malgaches to blacken their teeth (Heckel, Ann. l'Inst. Col. Marseille, i. 1903, 2nd fasc. p. 152).

Buchnera longifolia, Klotzsch, Fl. Trop. Afr. iv. Sect. 2, p. 398, "Dam-Pan" of the Gambia, is used as a blue-black dye (*Kew Bull.* 1891, p. 273).

A herb 1–2½ ft. high in swamps, Nupe (Barter Herb. Kew).

BIGNONIACEAE.

Crescentia, Linn.

Crescentia Cujete, *Linn.* Sp. Pl. (1753) p. 626.

A tree 20–25 feet high, branching horizontally at the head; trunk about a foot in diameter. Leaves narrow elliptic, undivided, arranged in fives. Flowers variegated green, purple, red and yellow, borne on the trunk. Fruit globular, gourd-like, about a foot in diameter, shell hard; seeds black, heart-shaped about 3 lin. across, embedded in an acid pulp.

Ill.—Commelin, Hort. Med. Amstel. Pl. t. 71 (*Arbor Americana cucurbitifera*, &c.); Jacq. Hist. Stirp. Am. t. 111; Jacq. Fragm. Bot. t. 33, f. 5; Tuss. Ant. ii. t. 19; Desc. Ant. iv. t. 244; Bot. Mag. t. 3430; Schnizlein, Ic. t. 152*, f. 1; Nuttall, N. Amer. Sylva, ii. t. 103; Contr. U.S. Nat. Herb. viii. t. 32; Bull. Herb. Bois. iv. (1896) t. 1.

Vernac. names.—[Jicara (Mexico); Higuera (Guam, Porto Rico) *Safford*]; Ticaro (Nicaragua, Mus. Kew). Calabash tree.

Native of the West Indies and S. America; wild or cultivated.

The fruit or Calabash is used in the West Indies, &c., for various domestic purposes—cups, spoons, bowls, boxes for tobacco, water bottles, kettles, &c., many of the articles being ornamented with carving. The pulp is used medicinally, as a diuretic, French Guiana (Heckel, Les. Pl. Med. et Toxiq. Guy. Franc. in Ann. Inst. Col. Marseille, iv. 1897, p. 100); with other ingredients makes an excellent cough remedy (Lunan, Hort. Jamaicensis, p. 140) and various medicinal uses are attributed to it generally. In the West Indies a syrup is made from the pulp of the fruit, used in dysentery and as a pectoral; in West Africa the leaves with those of *Adansonia digitata* are boiled and eaten and the seeds are eaten roasted (Pharmacogr. Indica, iii. p. 25).

The wood is described as very tough and flexible, used for stools, chairs, saddle-trees, tool handles, shafts, &c., being obtainable only in narrow planks about 8 in. wide (Lunan, Hort. Jamaicensis, p. 140; Tech. Rep. & Sci. Papers, Imp. Inst. (1903) p. 263); weight, 54·69 lb. per cubic ft. (Imp. Inst. l.c. p. 267).

Propagated by seeds. Cultivated in Old Calabar, Lagos and other parts of Nigeria. Has been known in this country according to the Hortus Kewensis since 1690.

Ref.—"*Crescentia Cujete*," in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 24-26.

Stereospermum, Cham.

Stereospermum Kunthianum, *Cham.*; Fl. Trop. Afr. IV. Sect. 2, p. 518.

Ill.—Baillon, Adansonia, ii. t. 4 (*S. dentatum*); Bureau, Monogr. Bignoniaceae, t. 29 (*S. dentatum*), Malpighia, viii. (1894) t. 9 (*S. dentatum*); Notizbl. Bot. Gart. Berlin, 1909, App. xxii. p. 38, f. 14; Agric. Col. 1911, Suppl. p. 119.

Vernac. names.—Ayada (Oloke-Meji, *Foster*); Samr (Arabic, *Muriel*); Arghesana, Erghesana (Eritraea, *Fiori*).

Widely spread in Upper Guinea, Nile Land, Congo Free State and Mozambique District. An ornamental tree, 15–45 ft. high. This tree ornaments the hill-sides by its rich apple-like blossom perfuming the air for some distance, Grant (Herb. Kew). Flowers November–January, Zungeru (Elliott, Herb. Kew); flowers lilac with purple lines, Nupe (Barter, Herb. Kew); a small tree in Savannah, Lagos (Rowland, Herb. Kew); in flower February and in fruit March, Mabira Forest, Uganda (Ussher, Herb. Kew).

Newbouldia, Seem.

Newbouldia laevis, *Seem.*; Fl. Trop. Afr. IV. Sect. 2, p. 521.

Ill.—Pal. de. Beauv. Fl. Oware & Benin, i. t. 29 (*Spathodea laevis*); Bot. Mag. t. 3681 (*Spathodea pentandra*); Hortic. Univ. v. (1844) p. 357 (*Spathodea speciosa*); Ann. de Gand, v. (1849) t. 260; Fl. des Serres. vi. (1850–51) t. 634 (*Spathodea laevis*); Bot. Mag. t. 4537 (*Spathodea laevis*); Lemaire, Le Jard. Fl. i. (1851) t. 51 (*Spathodea laevis*); Bureau, Monogr. Bignoniaceae, t. 15;

Notizbl. Bot. Gart. Berlin, 1909, App. xxii. p. 36, f. 13; Engl. & Drude, Veg. Erde, ix. p. 715, f. 616.

Vernac. names.—Aboti (Uwet, *McLeod*); Akoko (Lagos, *MacLeod, Hislop*); Akoko (Ebute Metta, *Millen*); [Akoko (Yoruba), Ikhimi (Benin) *Thompson*]; Sasanenasa or Sasanemasa (Ashanti, *Chipp*); Aviangti (Gold Coast, *Easmon*); Kindee or Brochea (Sierra Leone, *Moloney, Oldfield*); Quime (Island of St. Thomas, *Welwitsch*); Mofanie (French Guinea, *Farmar*).

Widely spread from Sierra Leone to the Congo.

Used for fever in Sierra Leone (Oldfield, Mus. Kew; Moloney, For. W. Afr. p. 397, *Newbouldia* sp.) in the treatment of dysentery, Gold Coast (Col. Rep. Misc. No. 1, 1891, p. 58). Leaves, in decoction used for the cure of sore eyes by the natives of Uwet, S. Nigeria (McLeod, Herb. Kew). Bark used medicinally as a stomachic, Aburi, Gold Coast (Johnson, Herb. Kew).

A tree of vigorous habit, sometimes shrub-like 10–40 ft. high. Cultivated to mark boundaries, S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 7). Grows freely and may be propagated by cuttings; planted in native towns, Kontagora (Dalziel, Herb. Kew); commonly employed to make fences, Ivory Coast (Chevalier Bull. Soc. Nat. d'Accl. France, 1912, p. 138); found in open monsoon forest, Ashanti (Chipp, Herb. Kew); in fruit September, French Guinea (Farmar, Herb. Kew), a small tree flowering and fruiting in February at Old Calabar.

Ref.—"*Newbouldia laevis* in the treatment of Dysentery," Dr. Easmon, in Col. Rep. Misc. No. 1, 1891, pp. 54–57.

Markhamia, Seem.

Markhamia tomentosa, *K. Schum.*; Fl. Trop. Afr. IV. Sect. 2, p. 528.

Vernac. names.—Iwe (Lagos, *MacGregor, Dawodu*); Akoko (Lagos, *Phillips*).

Senegambia to the Cameroons.

Said to be used medicinally, Lagos (MacGregor, Herb. Kew). A tree 30 ft. high.

Var. **gracilis,** *Sprague,* has been recorded from Nupe (Barter, No. 1310, Herb. Kew).

The wood of *Markhamia platycalyx* (*Dolichandrone platycalyx*, Baker), Fl. Trop. Afr. iv. Sect. 2, p. 525. "Lusambya" of Uganda, is said by Mahon (Herb. Kew) to be one of the finest of local timbers.

Spathodea, Beauv.

Spathodea campanulata, *Beauv.*; Fl. Trop. Afr. IV. Sect. 2, p. 529.

Ill.—Pal. de Beauv. Fl. Oware & Benin, tt. 27, 28; Geel, Sert. Bot. v.; Paxton, Fl. Gard. iii. t. 104; Fl. des Serres, viii. (1853) t. 830; Lemaire, Le Jard. Fl. iv. (1854) tt. 388, 389; Bot. Mag. t. 5091; Journ. Bot. iii. (1865) t. 40; Ann. Jard. Bot. Buitenzorg, viii. 1890, t. 13; Engl. Bot. Jahrb. xxxviii. 1907, p. 263, f. 2A; Engl. & Drude, Veg. Erde, ix. p. 636, f. 546 (fl.); Gard. Chron. Dec. 23rd, 1911, p. 458, f. 183 (habit).

Vernac. names.—Oruru (Lagos, *MacLeod, Hislop, Foster*), [Oruru (Yoruba), Okwokwi (Benin) *Thompson*]; Odoumanki (Gold Coast, *Farmar*); Osisirin (Accra, *Johnson*); Seseru (Accra, *Sander*); Sambi-Sambi (Angola, *Monteiro*); Mombata (Lukolela, Congo, *De Wildeman*); Muten-andûa, Ndemand, Mangel-andûa, Mutenguenandûa, or Andenandûa (Golungo Alto, *Welwitsch*); Kifabakasi (Baganda, Uganda, *Dawe*); Kokomayur, Gouro, Nkokion (Ivory Coast, *Courtet*); Kokomayur (Mbonoi, Ivory Coast, *Chevalier*); Tchioge (Sierra Leone, *Scott Elliot, Moloney*). —African Tulip Tree, Tulipier du Gaboon.

Widely spread from Sierra Leone to the Congo and Angola, extending to Uganda.

Used in the treatment of ulcers, Gaboon (Moloney, For. W. Afr. p. 397; Easmon, Col. Rep. Misc. No. 1, 1891, p. 55); bark used for the cure of dysentery, Gold Coast (Farmar, Herb. Kew).

Wood white and very soft, Angola (Monteiro, Herb. Kew); S. Nigeria (Thompson, List of For. Trees, S. Nig. 1910, p. 7); Congo (De Wildeman, Pl. Util. Congo, ii. 1904, p. 367), Ivory Coast (Courtet, L'Agric. prat. pays chauds, x. i. 1910, p. 463; Chevalier, Bois Cote d'Ivoire, p. 145); density 0·363. Suitable for carpentry work (Courtet, l.c.); and suggested for making paper pulp (Chevalier, l.c.). A specimen of the wood in the Kew Museum, grown in Madras, weighs 40 lb. per cubic ft. (Gamble, Man. Ind. Timb. p. 511).

A strikingly handsome tree, 20–70 or more ft. high, smooth white stem without branches for a considerable height from the ground, luxuriant conical head of foliage, all studded with large flowers of a bright orange-scarlet, Angola (Monteiro, Herb. Kew). One of the most beautiful in Angola, flowering from September to the end of May, and fruiting in June and July (Hiern, Cat. Welw. Afr. Pl. iv. p. 791); a very handsome tree in a village near Kabba, and grown in Lokoja, N. Nigeria, for decorative purposes, flowering in September (Parsons, Herb. Kew); a small tree, open monsoon forests, W. Ashanti (Chipp, Herb. Kew); a tree 60 ft. in the delta of the Niger (Barter, Herb. Kew). Suitable for avenues or as a shade-tree, raised from seed, which is winged, light, and freely distributed by wind.

Ref.—Les Bourgeons Floraux du *Spathodea campanulata*, Beauv., Treub, in Ann. du Jardin du Buitenzorg, viii. 1890, pp. 38–45.

Kigelia, DC.

Kigelia aethiopica, *Decne.*; Fl. Trop. Afr. IV. Sect. 2, p. 538.

Ill.—Deless. Ic. v. tt. 93a 93b; Schnizlein, Ic. t. 152; Agric. Col. Italy, v. 1911, Suppl. p. 121, f. 164; Thonner, Blütenpfl. Afr. t. 138.

Vernac. names.—Om Shutur (Arabic, *Muriel*); Mederba, Meder-deur, Selsele, Ingula, Salasile (Eritrea, *Fiori*).

Kordofan, Uganda, B.E. Africa, etc.

A tree 20–60 ft. high.

Var. **bornuensis**, *Sprague*, Fl. Trop. Afr. l.c.

Bornu (Vogel, No. 83, Herb. Kew); Katagum (Dalziel, No. 105, 1907, Herb. Kew).

The crown may be from 80–90 ft. through. Fruits 18 in. long 7 in. thick, pendant on stalk nearly 7 ft. long, Bornu (Vogel, l.c.): planted in towns, Katagum (Dalziel, l.c.).

Kigelia africana, *Benth.*; Fl. Trop. Afr. IV. Sect. 2, p. 536.

Ill.—Engl. Bot. Jahrb. xxxviii. 1907, p. 263, ff. B-C.; Engl. & Drude, Veg. Erde, ix. (i.) 2, p. 594, f. 513 (habit).

Vernac. names.—[Rahaina, Nonon giwa (*Hausa*); Jirlahi (Fufulde), Belongu (Kanuri), *Dalziel*]; Etua (Sierra Leone, *Scott Elliot*); Etua (Fantu, *Moloney*).

Senegal, Gold Coast, S. Nigeria—Adaba, Cross River; N. Nigeria—Borgu, Bornu, Upper Benue and Lake Chad region.

A tree 20–50 ft. high. Splendid for shade, conspicuous on the Upper Benue, and in the Eastern Provinces, and said to replace the Kuka (*Adansonia digitata*) in parts of Bornu and Lake Chad (Kew Bull. 1910, p. 139).

Kigelia pinnata, DC. Fl. Trop. Afr. iv. Sect. 2, p. 537, a tree similar in appearance to *K. africana*, is said to occur in West Africa, but there are no specimens at Kew to support this view. The following references probably belong here:

Used by the natives of the Gold Coast in rheumatism and dysentery (Easmon, Col. Rep. Misc. No. 1, 1891, p. 55; Moloney, For. W. Afr. p. 398, *K. pinnata*); a remedy for dysentery in West Africa (Pharm. Journ. [4] xxiii. 1906, p. 105, "Aviangti," *K. pinnata*); the bark and fruit used by the natives, medicinally. S. Nigeria (Thompson, List. of For. Trees, S. Nig. 1910, p. 7, "Pandoro" (Yoruba), Ijokham (Benin), *K. pinnata*).

PEDALIACEAE.

Sesamum, Linn.

Sesamum indicum, *Linn.*; Fl. Trop. Afr. IV. Sect. 2, p. 558.

Ill.—Rheede, Hort. Mal. ix. tt. 54, 55 (*S. orientale*); Plukunet, Almag. t. 109, f. 4 (*Sesamum alterum*, etc.); Rumpf. Amb. v. t. 76, f. 1; Gaertner, Fruct. Sem. Pl. t. 110 (*S. orientale*); Lam. Encycl. t. 528 (*S. orientale*); Plenck, Ic. t. 508 (*S. orientale*); Bot. Mag. t. 1688; Desc. Ant. iv. t. 268 (*S. orientale*); Velloso, Fl. Flum. vi. t. 90 (*S. brasiliense*); DeCandolle, Pl. Rares Jardin Genève, t. 5; Blanco, Fl. Filip. t. 273 (var. *grandidentata*); Endlicher, Ic. t. 70 [4105]; Fl. des Serres, ii. (1846) t. 6 (*Anthadenia sesamoides*); Schnizlein, Ic. t. 153, f. 22 (fruit); Wight, Illust. t. 163; Belgique Hortic. ix. (1859) t. 27 (*Sésame d'Orient*); Bentl. & Trimen, Med. Pl. t. 198; Duthie, Field Crops, t. 42; Greshoff, Nutt. Ind. Pl. t. 6; Engl. Pflan. Ost. Afr. B, p. 487, f. 21; Engl. & Prantl, Pflan. iv. pt. 3, B, f. 100 A L; Köhler, Med. Pflan. iii.; Notizol. Bot. Gart. Berlin x. 1910, App. xxii. p. 119.

Vernac. names.—Beni (Lagos, *Moloney*); Ridi, Karkashi, Nome, Marasiri (Yola, *Dalziel*); Ridi (Hausa, *Dudgeon*); Til (Bengal,

Dymock); Til (Sierra Leone, *Scott Elliot*); Beniseed (Sierra Leone, *Garrett*); [Kinu Thorny (Sierra Leone), Nguilla, N'gilla, Anguilla, Canguilla, Ricola, Ocoto (Angola), Gergelim (Portuguese) *Welwitsch*]; Béné, Loubougay, Diguilliny, Foré (F.W. Africa, *Pobéguin*); Sim-Sim, Eirawi (Sudan, Bull. Imp. Inst. xi. 1913, p. 56); Sim-Sim (Zanzibar, Kew Bull. 1892, p. 90); Chitowe (Port. E. Afr. *Johnson;* Katunga, *Scott*); Mafuta (Mozambique, *Negreiros*); Voahazo (Madagascar, *Heckel*); Kunjit (Afghanistan, *Aitchison*); Ajonjoli (Porto Rico, *Cook & Collins*); Ajonjoli (Cuba, *Baker*); Hsiang Yu (Ssuchuan, China, *Hosie*); Gingili (India, *Watt*); Goma (Japan, *Nagai*); Chi-ma (China, *Smith*). —Palaver Sauce Plant (Sierra Leone).

Believed to be a native of Tropical Africa; widely spread in the Tropics and Sub-Tropics.

The chief use of this plant is the production of oil from the seed, used everywhere for food, also for soap-making and as a substitute for olive oil. In India, used occasionally for lighting, for anointing the body, in medicine, perfumery, and in making sweetmeats; the seeds are also made into sweetmeats, and, toasted and ground, they are made into cakes, etc; a lotion, made from the leaves and a decoction of the root, is used as a hair wash; and the stalks are used as fuel and as manure (Dict. Econ. Prod. India).

The cake made from the residue after the extraction of the oil is an important cattle food.

The exports of seed from Northern Nigeria were, in 1912, 1,058,319 lb., value £2972; 1913, 2,718,795 lb., value £9245, the approximate local purchasing price being £7 per ton (Col. Rep. Ann. No. 821, 1914, p. 33). Marseilles is perhaps the most important centre of the trade in Europe, to which port the quantity of seed consigned from India alone is approximately 700,000 tons annually.

The price of Beni seed from West Africa, in the Liverpool Market, July, 1914, was £17 per ton, and in July, 1915, £15–£15 10s. per ton.

The cultivation in Tropical Africa is essentially native and comparatively easy. Two principal varieties are grown—"black seeded" and "white seeded"; the white may vary from pure white to pink or red; the oil from the black seed is more suitable for industrial purposes and that from the white for food.

The seed may be sown broadcast or in rows 1–1½ ft. apart, and about 10 lb. will be required to sow an acre.

It thrives in sandy loam and comes to maturity in 3–5 months. The sowings should be arranged so that the crop will have plenty of moisture while growing in the early stages, approximately for 2 months, and drier conditions when the plants are flowering and ripening the seed. When ripe the plants may be cut with a matchet near the ground, put into stacks to dry, and finally the seed beaten or shaken out from the capsules. A good crop would be from 350–700 lb. of seed per acre.

Ref.—"Sesame Seed (*Sesamum indicum*)," in Trop. Agriculture, Simmonds, pp. 412–415 (E. & F. N. Spon, London, 1877).——

"*Sesamum indicum*," in Med. Pl. Bentley & Trimen, No. 198, 5 pp.——"*Sesamum indicum*," in Dict. Econ. Prod. India, Watt, vi. 1893, pp. 502–542.——"*Sesamum indicum*," in Pharmacogr. Indica, Dymock, Warden & Hooper, iii. pp. 26–33 (Trübner & Co. Ltd. London, 1893).——"Gingelly or Sesame Oil," Handbook No. 21, 1893, Imp. Inst. Series, pp. 1–44.——"*Sesamum indicum*, in Nuttige Indische Planten, Greshoff, pp. 21–24.——"*Sesamum indicum*," in Med. Pflanzen, Köhler, iii. 5½ pages.——Le Sesame: Béné en langue indigène (*Sesamum orientale*), Dumas, in L'Agric. prat. pays chauds, vi. part 1, 1906, "L'Agric. dans la Vallée du Niger," pp. 349–350.——"*Sesamum indicum*," in Commercial Products of India, Watt. p. 981–987.——"Le Sésame de l'Extreme-Orient: *Sesamum indicum*," Eberhardt, in L'Agric. prat. pays chauds, xi. part 1, 1911, pp. 353–369; pp. 455–469; xi. part 2, 1911, pp. 19–36, illustrated.——"Cultivation and Utilisation of Sesamum Seed," in Bull. Imp. Inst. ix. 1911, pp. 259–272.——"Semen Sesami und Oleum Sesami" in Handbuch der Pharmakognosie, Tschirch, Lief. 27, Aug. 30, 1911, pp. 573–576 and Lief. 28, Nov. 24, 1911, pp. 577–579.——"La Récolte du Sésame en Mozambique" [Vice-Consul de France à Lourenço Marques], in L'Agric. prat. pays chauds, xii. part 1, 1912, p. 499. "Sesamum Seed": "Anglo-Egyptian Sudan" in Bull. Imp. Inst. xi. 1913, pp. 56–57.——"Sesamé Oil," in Fatty Foods: their Practical Examination, Bolton & Revis, pp. 223–225 (J. & A. Churchill, London, 1913).——"Sesamum Seed," in Col. Rep. Misc. No. 88, 1914, pp. 466–467.——Sudan, Abyssinia, Rhodesia, N. Nigeria.

Sesamum radiatum, *Schumach.*; Fl. Trop. Afr. IV. Sect. 2, p. 557.

Vernac. name.—Eku gogoro (Lagos, *Phillips*, *MacGregor*).

Nigeria, Sierra Leone, Cameroons, East Africa, etc.

An oil is obtained from the seeds, but the plant does not appear to be cultivated for the purpose. Punch (No. 78 Herb. Kew) on a specimen from Lagos calls it the "coloured variety of sesamum," and states that "the white variety [referring no doubt to *S. indicum*] is cultivated and seeds exported."

An erect herbaceous plant 2–4 ft. high, fœtid odour, ornamental, flowers purple. Found on waysides and in meadows, Zungeru (Dalziel, Herb. Kew), in cultivated ground, Nupe (Barter, Herb. Kew), common about the town of Asaba (Barter l.c.), and a common weed in many parts.

Ceratotheca, Endl.

Ceratotheca sesamoides, *Endl.*; Fl. Trop. Afr. IV. Sect. 2, p. 563.

Ill.—Linnaea, vii. tt. 1, 2; Endlicher, Atakta, Bot. t. 5.

Vernac. names.—Lodi (Acholi, Uganda, *Dawe*); Chinyolombosi (Lake Nyasa, *Johnson*, *Riddelsdell*).

Zungeru, Lokoja, Kontagora, etc., Nigeria; known also from Senegambia, Nile Land and Mozambique.

Seeds eaten as *Sesamum*, Uganda (Dawe, Herb. Kew); leaves cooked and eaten, Likoma Isles, Lake Nyasa (Archd. Johnson; Riddelsdell, Herb. Kew).

An annual up to 2 ft. high of erect slender habit. Found in

grassy land and waste places Zungeru, Kontagora, Lokoja (Dalziel, No. 148, Herb. Kew), cultivated as Sim-Sim, Acholi country, Uganda (Dawe, Herb. Kew), in sandy soil, flowering in October, Senegal (Roger, Herb. Kew), 2000–6000 ft., between Kondowe and Karonga (Whyte, Herb. Kew).

For cultivation see under *S. indicum*. The seeds are small (about 1 lin. across), brown or black.

ACANTHACEAE.

Thunbergia, Linn.

Thunbergia erecta, *T. Anders.*; Fl. Trop. Afr. V. p. 12.

Ill.—Bot. Mag. t. 5013 (*Meyenia erecta*).

Lagos, Old Calabar, also in Sierra Leone and the Gold Coast.

A decorative shrub 6–8 ft. high in Africa. It has been grown in gardens for more than 50 years.

Thunbergia Vogeliana, *Benth.*; Fl. Trop. Afr. V. p. 10.

Ill.—Bot. Mag. t. 5389 (*Meyenia Vogeliana*).

Vernac. name.—Ohohiro (Benin, *Foster*).

Benin, Nigeria; Cameroons and Fernando Po.

A decorative shrub, 8–15 ft. or more in height, mentioned (Bot. Mag. l.c.) as being more beautiful than *T. erecta*. There are several handsome climbing species of *Thunbergia* from Tropical Africa, though there appears to be no record of them from Nigeria.——*T. fragrans*, Roxb. Fl. Trop. Afr. v. p. 20, Bot. Mag. t. 1881, Roxb. Pl. Corom. i. t. 67, from Sierra Leone (probably introduced from E. Indies), introduced to the Royal Gardens, Kew, in 1796; *T. chrysops*, Hook. Fl. Trop. Afr. v. p. 21, Bot. Mag. t. 4119, from Sierra Leone, cultivated at Kew; *T. alata*, Boj. Fl. Trop. Afr. v. p. 16, from Sierra Leone, and throughout Tropical Africa. All are easily grown from seed or cuttings, as bushes or trained on arches or trellises, thriving in rich loam.

Hygrophila, R.Br.

Hygrophila spinosa, *T. Anders.*; Fl. Trop. Afr. V. p. 31.

Ill.—Wight, Ic. Pl. Ind. Or. t. 449 (*Asteracantha longifolia*); Mem. Acad. Turin, xxxvi. t. 7 (*Barleria hexacantha*).

Vernac. names.—Sare giuwa (Katagum, *Dalziel*, who translates the native name as "Prick the Knee"); Mafowo Kaunsonii (Lagos, *MacGregor*).

Widely distributed in Tropical Africa, India and Ceylon.

The whole plant—leaves, roots and seeds—is used medicinally in India (Watt. Dict. Econ. Prod. India). Used for stomach ache, Lagos (MacGregor, Herb. Kew); for extracting salt, Unyoro (Grant, *seq.*); salt consumed in the country is extracted in the Upper Oubangui region by the natives, who obtain the salt by burning the plant and washing the ash (Chevalier, Bull. Soc. Nat. d'Accl. France, 1912, p. 239).

An erect plant 5–10 ft. high, in swampy places, Nupe (Barter, Herb. Kew), in damp bush, Katagum (Dalziel, Herb. Kew), cultivated in villages, Unyoro (Grant, Herb. Kew: Trans. Linn. Soc. xxix. p. 126), not plentiful in Kabba (Parsons, Herb. Kew); cultivated in the Upper Oubangui region (Chevalier, l.c.).

Ref.—"*Hygrophila spinosa*, in Dict. Econ. Prod. India, Watt, iv. 1890, p. 316.——"*Hygrophila spinosa*," in Pharmacogr. Indica, Dymock, Warden & Hooper, iii. 1893, pp. 36–40.

Brillantaisia, Beauv.

Brillantaisia Lamium, *Benth.*; Fl. Trop. Afr. V. p. 38.

Ill.—Bot. Mag. t. 4717, f. 3 (fruit, *B. owariensis*); Engl. & Prantl, Pflan. iv. 1895, pt. 3 B, p. 296, f. 119 (*B. Palisotii*).

Lagos, Abeokuta, Old Calabar, Onitsha, Degema, Oban, and Lokoja; widely distributed in West Africa.

A herbaceous perennial, 3–4 ft., ornamental, flowers deep blue.

Acanthus, Linn.

Acanthus montanus, *T. Anders.*; Fl. Trop. Afr. V. p. 107.

Ill.—Bot. Mag. t. 5516.

Vernac. names.—Agamobo (Benin, *Dennett*); Ahon Ekun or Akawn Ekkun (Yoruba, *Moloney*, *Millson*); Lagos, *Phillips*, *MacGregor*); Akawn Ekkun (Sierra Leone, *Scott Elliot*).

Widely distributed in W. Africa, extending to Nyasaland, etc.

Used medicinally in Yoruba (Millson, Kew Bull. 1891, p. 209), Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 49).

A herbaceous plant about 3 ft. high, very ornamental. Found in damp ground, Ilaro, Lagos (Millen, Herb. Kew), in the shade of the large forests, elevation 6000–7000 ft. Masuku Plateau (Whyte, Herb. Kew); on Mt. Patti, Lokoja (Dalziel, Herb. Kew); readily raised from seed.

Crossandra, Salisb.

Crossandra flava, *Hook.*; Fl. Trop. Afr. V. p. 113.

Ill.—Bot. Mag. t. 4710.

Lagos, Yoruba, also from Sierra Leone and the Gold Coast.

Herb, 6–8 in. high, ornamental, flowers yellow; raised from seed.

Crossandra guineensis, *Nees*; Fl. Trop. Afr. V. p. 117.

Ill.—Bot. Mag. t. 6346.

Oban, S. Nigeria, and recorded from the Cameroons, Gold Coast and Fernando Po.

Herb, 2–8 in. high, very ornamental in the white calyx, white or lilac corolla, sometimes brownish-red bracts, and white veined leaves.

Justicia, Linn.

Justicia extensa, *T. Anders.*; Fl. Trop. Afr. V. p. 206.

Lagos, Cross River, and Tropical Africa, etc.

Used in S. Nigeria as a fish poison (Letter, Imp. Inst. to Kew, 1st March, 1904: Herb. Kew, note on leaf specimen).

A herbaceous plant 7 ft. high.

PERISTROPHE, Nees.

Peristrophe bicalyculata, *Nees*; Fl. Trop. Afr. V. p. 242.

Ill.—Lam. Encycl. t. 12, f. 2 (*Justicia ligulata*); Cav. Ic. i. t. 71 (*J. ligulata*); Retz. Acta Holm. (1775) t. 9 (*Dianthera bicalyculata*).

Vernac. name.—Ghati-Pit-Papra (Bombay, *Dymock*).

Niger Territory, Borgu, Bornu, etc., in Nigeria, and widely distributed in Tropical Africa, Tropical and Sub-Tropical India.

The plant macerated in an infusion of rice is said to be a useful remedy for poisonous snake-bites, Malabar (Watt. Dict. Econ. Prod. India; Moloney, For. W. Afr. p. 400).

The whole herb is gathered when in flower and dried for use as a substitute for *Fumaria parviflora*, the true "Pitpapra" (Dymock, Mus. Kew).

An erect annual and a common weed.

VERBENACEAE.

LANTANA, Linn.

Lantana Camara, *Linn.*; Fl. Trop. Afr. V. p. 275.

Ill.—Dillenius, Hort. Eltham. t. 56, f. 64 (*Camara Lama folio*, etc.); Lam. Encycl. t. 540; Buchoz, Herb. Col. Ameriq. t. 73 (*L. aculeata*); Gaertner, Fruct. Sem. Pl. i. t. 56 (*L. aculeata*); Bot. Mag. t. 96 (*L. aculeata*); Duhamel, Traité des Arbes, vi. t. 38 (*L. aculeata*); Desc. Ant. iv. t. 304; v. t. 370 (*L. aculeata*); Belgique Hortic. xviii. (1868), t. 10 (var. *hortensis*); Vidal, Fl. For. Filip. t. 74 D (fl. & fr.); Bettfreund, Fl. Argent. ii. t. 104.

Vernac. names.—Ewou-agogo or Ewon-agogo (Lagos, *MacGregor, Dawodu*); Ewon Adele (Lagos, *Foster*); Mariecrabe (French Guiana, *Heckel*); Camara, Cabará-caá (Argentine, *Bettfreund*); Cammara (Brazil, *Merck*); Ghaneri (Bombay, *Kenga*); Cariaquillo (Porto Rico, *Cook & Collins*); Durie (Java, *Evans, Sons & Co.*). Prickly Lantana, Wild Sage, Camara piquant.

Widely distributed in West Africa. Native of Tropical America, naturalised in many warm countries.

The leaves are used as sandpaper by joiners in Java (Descr. Cat. Bethnal Green Museum, 1875, p. 25).

An infusion of Cammara is given as a remedy for catarrhal affections of the respiratory passages, bilious fever, and as a diaphoretic; the drug is also used as an ingredient in aromatic baths and in fomentations (Merck's Ann. Rep. for 1893, p. 101). Used for fever in Lagos (MacGregor, Herb. Kew), for the same purpose in other parts of West Africa, mixed with leaves of *Ocimum viride* (African Lakes Corptn. Herb. Kew); and various medicinal uses are attributed to the plant in French Guiana (Heckel, Les Pl. Med. et Toxiq. Guy. Franç. in Ann. Inst. Col.

Marseille, iv. 1897, p. 127). The seeds are used in Java as an eye medicine (Mus. Kew).

An oil may be distilled from the flowers and leaves (see Semi-Ann. Rep. Schimmel & Co. Nov. 1908, p. 140; Oct. 1909, p. 73 and Oct. 1913, p. 66), the constituents of which have not yet been identified (see Chemist & Druggist, May 16, 1914, p. 46).

An ornamental shrub, 4–10 ft. high, suitable for planting in mixed hedges, improved by cutting back regularly. Easily raised from seed or cuttings, and grows freely in almost any situation. Under cultivation numerous handsome varieties have been raised, amongst which may be mentioned "alba," "brilliantissima," "compacta," "fulva," "grandiflora," "pulcherrima," "Queen Victoria," "triomphe," "variegata," etc.

In many countries where the plant has been introduced it is regarded as a pest, despite its medicinal and ornamental value. Experiments are being made in New Caledonia with a fly (Agromyzidae) introduced from Hawaii to compass its destruction (Journ. d'Agric. Trop. *seq.*).

Ref.—"La Lantana et sa Destruction," Marquès in L'Agric. prat. pays chauds, vii. part 2, 1907, pp. 70–76.—"La Destruction du Lantana" in Journ. d'Agric. Tropicale, xii. 1912, p. 154—"La *Lantana Camara*, Linn. sa Vegetation a Alger," Rivière, in Bull. de la Société Nationale D'Acclimatation de France, lix. 1912, pp. 598–601.

Lantana salvifolia, *Jacq.*; Fl. Trop. Afr. V. p. 276.

Ill.—Jacq. Hort. Schoenbr. iii. t. 285; Wight, Ic. Pl. Ind. Or. t. 1464 (*L. indica*).

Vernac. name.—Eluku (Lagos, *MacGregor, Phillips*).

Widely distributed in Tropical Africa, etc.

Fruit edible.

A shrub 1–6 ft. high, in rocky ground Lokoja (Parsons, No. 11, 1908, Herb. Kew); ornamental, corolla rose-coloured.

Lantana trifolia, *Linn.*; Fl. Trop. Afr. V. p. 277.

Ill.—Sloane, Hist. Jamaica, ii. t. 195, f. 3 (*Periclymenum rectum*, etc.); Bot. Mag. t. 1449.

Wild Sage.

Lagos (Rowland, 1890, Herb. Kew). Native of Tropical America; naturalised in Tropical Asia.

Fruit edible; more pulpy than in any other species (Bot. Mag. l.c.); the leaves are used in baths for dropsical people to cleanse the skin and in all hot fomentations (Sloane, Hist. Jamaica, ii. p. 82).

A shrub up to 6 ft. high; found on the beach at Boca near Limon, Costa Rica (Tonduz, Herb. Kew); grows everywhere in the savannahs in all the Caribbean Islands (Sloane, l.c.).

Lippia, Linn.

Lippia adoensis, *Hochst.*; Fl. Trop. Afr. V. p. 280.

Vernac. names.—Fetfettis (Sierra Leone, *Scott Elliot*); Bormbor (Gambia, *Moloney*).—Gambia Tea.

Lagos, Oloke-Meji, and in Tropical Africa generally.

Used medicinally by the natives, Gold Coast (Johnson, Herb. Kew), in Angola (Monteiro, Herb. Kew), and as a fever drink, Gambia (Mus. Kew; Moloney, For. W. Afr. p. 401).

An undershrub, 4–5 ft.; Oloke-Meji (Foster, Herb. Kew), Ogun River, Lagos (Millen, Herb. Kew). Flowers white, plant very fragrant, Borgu (Barter, Herb. Kew), plant strongly aromatic when bruised, Angola (Monteiro, l.c.), in dry meadows and grassy jungle, Uganda (Wilem, Herb. Kew). *Lippia nodiflora*, Rich.; Fl. Trop. Afr. v. p. 279, a creeping perennial widely distributed in Tropical Africa—Senegal, Mozambique, etc., is recommended for making lawns in Egypt and similar hot, dry climates (Cook & Collins, Econ. Pl. Porto Rico, p. 175).

Stachytarpheta, Vahl.

Stachytarpheta indica, *Vahl*; Fl. Trop. Afr. V. p. 284.

Ill.—Sloane, Hist. Jamaica, i. t. 107, f. 1 (*Verbena folio*, etc.); Jacq. Obs. t. 85 (*Verbena jamaicensis*); Bot. Mag. t. 1860 (*S. jamaicensis*); Lodd. Bot. Cab. t. 820 (*S. jamaicensis*); Vidal, Fl. For. Filip. t. 74 B.

Vernac. names.—Iru-ala-ngba (Lagos, *Dennett*); Iru amurin (Lagos, *Dawodu*); Payun payun, Akitipa (Lagos, *MacGregor, Dawodu*); Crête de Inde, Crête-dinde (French Guiana, *Heckel*); Cachinde ca menha (Loanda, *Welwitsch*); Herbe queue de Rat (Seychelles, *Thomasset*).—Bastard Vervain of Jamaica.

Widely distributed in Tropical Africa, Asia and America.

The plant is regarded as a valuable remedy for dysentery in French Guiana (Heckel, Les Pl. Med. et. Toxiq. Guy, Franç. in Ann. Inst. Col. Marseille, iv. 1897, p. 109), Loanda (Hiern, Cat. Welw. Afr. Pl. iv. p. 831), Lagos (MacGregor, Herb. Kew) and Jamaica (Sloane, l.c. i. p. 171; Archer, Mus. Kew).

A shrubby plant, 3–6 ft. high, variously described as an annual, biennial or triennial from seed or cuttings; a common weed in waste places.

Duranta, Linn.

Duranta Plumier *Jacq.*; Fl. Trop. Afr. V. p. 287.

Ill.—Plumier, Ic. Burm. t. 79 (*Duranta inermis*); Jacq. Ic. Pl. Rar. iii. t. 502; Gaertner, Fruct. Sem. Pl. i. t. 57; Bot. Reg. (1817) t. 244; Lodd. Bot. Cab. t. 280; Drapiez, Herb. Amat. de Fleurs, viii. t. 568; Dict. Sc. Nat. t. 41; Lam. Encycl. t. 545; Baillon, Adansonia, ii. t. 5, ff. 1–10; Bocquillon, Verbenaceae, t. 5, ff. 1–10; Gard. Chron. Jan. 14th, 1888, p. 45, f. 9 (var. *alba*).

Vernac. names.—Jacu (Cantagallo, *Peckolt*); Azote-caballo, Lila, Lluvia (Porto Rico, *Cook & Collins*).

Lagos, Old Calabar, and widely spread in Tropical Africa; native of Tropical America.

A shrub, 5–10 ft. high, sometimes spiny, with long, handsome terminal racemes of bright lilac flowers; planted by Europeans in Senegal and Lower French Guinea to make hedges and by the

natives about their huts (Chevalier, Bull. Soc. Nat. D'Accl. France, 1912, p. 240). May be propagated by layers or cuttings.

Tectona, Linn. f.

Tectona grandis *Linn. f.* Suppl. Pl. (1781) p. 151.

A large deciduous tree, with quadrangular branchlets. Leaves large, blade 1–2 ft. long, correspondingly broad, cuneate, narrowed into the petiole—1–1½ in., rough on the upper surface, densely grey or brown tomentose on the under surface. Flowers white, in erect panicles 1–3 ft. long. Fruit hard, bony, ⅜–½ in. diam., enclosed in a spongy covering about ¼ in. thick, the whole covered with the persistent calyx, a loose papery brown envelope, resembling that of *Physalis*. Seeds 1–3, small.

Ill.—Rheede, Hort. Mal. iv. t. 27; Rumpf, Amb. iii. t. 18; Gaertner, Fruct. Sem. Pl. i. t. 57; Lam. Encycl. t. 136 (*Theka*); Roxb. Pl. Corom. t. 6; Blanco, Fl. Filip. t. 114; Bocquillon, Verbenaceae, t. 10, ff. 11–20; Brandis, Illustr. For. Fl. India, t. 44; Bedd. Fl. Sylv. t. 250; Vidal, Fl. For. Filip. t. 74 A; Ahern, Philippine Woods, p. 86; Gamble, Manual Ind. Timb. p. 526 (habit); Journ. Indian Art & Industry, xiii. (1910), t. 17 (Taungya Teak plant 6 months old; stump girdled and felled showing coppice growth); Indian Forest Record, iii. part 1, 1911, t. 1 (tree 152 ft. high); L'Agric. prat. pays chauds, xi. 1911, part 2, p. 122, f. 98; Talbot, For. Fl. Bombay, ii. p. 347, f. 450 (seedling); Unwin, Report, Affor. Togo (1912), f. 1 (habit, tree 10 years old at Lome), ff. 20–24, 31, 32.

Vernac. names.—Tekku, Tek, Teka, or Teku (India, *Gamble*); Ticla, Dalondan, Yate, Calayate or Yati (Philippines, *Ahern*) Kuyon (Burma, *Brandis*); Mai Sak (Siam, Mus. Kew).—Teak, Indian, Siam and Burma Teak.

Native of India, Burma and Siam. Cultivated in Assam, Bengal, Java, Sumatra, Southern Nigeria, Togoland, etc.

The leaves yield a red dye and they are used as plates for packing and for thatching.

An oil obtained from the wood is used in Burma for medicinal purposes; also as a substitute for linseed oil and as a varnish (Gamble, Man. Ind. Timb. p. 532). A black tar, obtained by destructive distillation of the wood, is used for medicinal purposes in S. India and Burma (Watt. Comm. Prod. India, p. 1070).

The wood is used in India for house- and ship-building, bridges, railway sleepers, furniture, etc. (Gamble, l.c. p. 532). A special feature of the wood is that it can be used in combination with metal—steel or iron not corroding when in close contact with it, and it is not attacked by white ant. The weight when seasoned varies from 38–45 lb. per cubic ft., but when freshly cut and green it is much heavier and sinks in water.

The higher cost of Teak in recent years has brought substitutes into the market under the same name, as "Yang Teak" (*Dipterocarpus sp.*); "Eng Teak" (*Dipterocarpus tuberculatus*), "Borneo Teak" (*Dryobalanops aromatica*), but although good these woods have not the same sterling qualities as true Teak. "Tampinis"

(*Sloetia sideroxylon*), and "Balan" (*Parinarium oblongifolium*), timbers of the Dutch East Indies and the Malay Peninsula, are recommended as substitutes by DeCoque (Trop. Agric. xxxix. 1912, p. 161). *Afzelia bijuga*, A. Gray, a fine timber-tree of the Malay Isles and Polynesia, "Melila," of British New Guinea, is sometimes referred to as "Papuan Teak."

Under cultivation the tree requires a tropical climate with a rainfall approaching 100 in., rich, deep, well-drained soil—sandstone or alluvium, etc., and an open situation. Propagated by seed (the whole fruit sown), which germinates in from 3–4 weeks and usually requires soaking in water for about 2 days, or roasting before sowing. They may be sown at stake, raised in nursery beds, bamboo pots or baskets, and as the plants develop a long tap root they require great care in transplanting to permanent places. Charred seeds collected from a burnt teak forest have been found to germinate very successfully within a fortnight, and it is recommended to sow them on prepared beds near the area to be regenerated, where the seedlings can be transplanted a month or two after sowing (Mascarenhas, Indian Forester, xli. 1915, p. 147), and the same practice is common in Java (l.c. 1892, p. 289).

In the nursery the seedlings will require to be spaced at least a foot apart, and in the plantation 10 ft. by 10 ft., thinning out as required.

In the general care of a plantation there are certain well-defined operations it is advisable to observe. These, according to Gamble (Manual Indian Timbers, p. 527), are to girdle isolated trees only with the object of relieving existing seedlings; to leave sound trees, likely to improve, in localities whence large timber can be extracted; to fell and not girdle trees attacked by epiphytic *Ficus*; and to pay attention to creeper-cutting.

On alluvial soil the growth in length is estimated at the rate of about 6 ft. a year and later at the rate of about only 1 ft. a year; trees with a girth of from 25–34 in. are from 77–87 ft. high, and, under favourable conditions throughout, they may be expected to attain a height of 150 ft. in soil of this description (l.c. 1st ed. (1881) p. 287). It is stated that plantations made on gneiss and laterite show a much slower rate of growth (l.c. p. 286).

Felling is recommended to commence when the average girth at breast height is 6 ft. 6 in., and the period of exploitation is given as 95 years; on first-class soils [alluvium] and 140 years on second-class soils [laterite] with a total yield per acre of 3000 and 2000 cubic ft. respectively. Under conditions of "high forest with a clean felling of the final crop and artificial regeneration," the final crop on first-class soil giving not less than 40 trees, and on second-class soil not less than 50 trees, per acre (Lushington, Rep. and Working Scheme Nilambur Teak Plantation, 1898, p. 41; Watt. Comm. Prod. India, p. 1070; Gamble, Man. Ind. Timb. p. 528). The above figures are recorded from Nilambur where the climate is approximately that of the Niger Delta.

The value of the wood in London (Feb. 1915) c.i.f. per load or ton (50 cubic ft.) was quoted—for Timber £14–£30 (Java, £8–£22); Flitches £20–£30 (Hewn Java, £12–£20); Planks, £15–£30

(Java, £12–£19) (C. Leary & Co., Indian Forester, xli. May, 1915, p. xlii.). The price for selected Indian Teak, 1st quality on the Calcutta Market May, 1915, was Rs. 160–Rs. 170 per ton (l.c. p. xlv.).

The returns in "Loads" [50 cubic ft.] for the five years 1909-13 imported into the United Kingdom were 1909—33,857, value £540,109; 1910—58,830, value £956,244; 1911—55,425, value £906,601; 1912—50,950, value £857,794; and in 1913—47,772, value £879,254, chiefly from Java, Siam, and British India (Trade of the Unit. Kingdom, i. 1914, p. 205).

Samples of teak wood from trees about 20 years old (in 1912) at Ebute Metta Gardens (Col. Rep. Ann. No. 782, 1914, p. 15), tested by Prof. Dalby, indicated an equality with Burma Teak in resistance to compression, but showed inferiority in transverse strength; the working properties of the timber were excellent, and commercial experts reported that if similar wood could be supplied in bulk, free from knots, it could be used for any purpose for which East Indian Teak is employed (Bull. Imp. Inst. 1914, pp. 361, 367; Col. Rep. Ann. No. 825, 1915, p. 34; No. 816, 1914, p. 43). The plant is being propagated and planted on an extensive scale in the various Forest Reserves (*see* p. 40) in the Southern Provinces of Nigeria. An experimental plantation at Oloke-Meji, covering 43 acres in 1910 (Col. Rep. Ann. No. 695, 1911, p. 11; Thompson, Ann. Rep. Forestry Dept. S. Nig. 1911, p. 5) had proved so successful as to warrant a considerable extension in the cultivation (Govt. Gaz. S. Nigeria, Oct. 6th, 1909, Address by H.E. the Governor, Leg. Council for year 1910, p. 1380). The dimensions of some trees, $3\frac{1}{2}$–$8\frac{1}{2}$ years old, at Oloke-Meji Jan. 1912, were from 12 ft. high with a girth of 4 in. to 32 ft. high with a girth of 15 in. in the trees $3\frac{1}{2}$ years old, and 47·5 ft. high, girth 37 in. to 51 ft. high, girth 42·75 in. in trees $8\frac{1}{2}$ years old, and the average girth of trees $2\frac{1}{2}$ years old in the Mamu Reserve was 8·8 in. (Thompson, l.c. p. 6). Seeds obtained from India, Burma and Togoland were being grown.

The tree in Togoland is grown more or less in association with "African Mahogany" (*Khaya senegalensis*, etc., see pp. 152–155, *Afzelia africana* (p. 272), "Sasswood" (*Erythrophloeum guineense*, see p. 278), "Ebony" (*Diospyros mespiliformis*, p. 425), *Funtumia elastica* (p. 453) and *Chlorophora excelsa*, the object of this interspersion of other trees being to shade the ground at the time the Teak trees lose their leaves (Unwin, Rep. Affor. Togo, *seq.*, Bull. Imp. Inst. xi. 1913, p. 169). The plantations in Java, where in 1889, in addition to 1,455,000 acres of Natural Teak Forests, there were about 84,000 acres planted (Indian Forester, xvii. 1891, p. 448) have subsidiary crops of tobacco, tapioca (Cassava), maize, groundnuts, etc, (Indian Forester, xviii. 1892, p. 285) growing in the early stages, the cost of clearing and planting the teak trees being calculated at about £1 per acre.

It is usual to girdle trees and leave them standing for about 3 years to season preparatory to felling and logging; this facilitates conveyance by water, but it has been found in Burma that there is practically no difference in the strength of the timber seasoned standing, and when felled and seasoned in the log, nor is

there any difference in this respect between plantation-grown teak and that from Natural Forests (Pearson, Indian Forest Bull. No. 14, 1913, *seq.*).

These are strong recommendations in favour of plantations, and it would seem that the cultivation of this tree in suitable parts of Nigeria may be continued with every prospect of success.

Ref.—Report on the Teak Forests of the Tenasserim Provinces, Falconer, pp. 1–286, with other Papers on the Teak Forests of India (Calcutta, 1852).——Report on the Teak Forests of Pegu, Brandis (1856), pp. 1–54 (London. 1860).——Teak: Its Production, Bryce, Bombay Burmah Trading Corptn., Ltd., pp. 1–8 (Inter. Forestry Exhib., Edinburgh, 1884).——"Teak Cultivation in Java," Buurman, in the Indian Forester, xviii. 1892, pp. 285-292: Transl. of a Pamphlet "De Djaticultuur, by Dr. Slym, Dep. Cons. of Forests, Moulmein.——"*Tectona grandis*," in Dict. Econ. Prod. India, Watt, vi. part 4, 1893, pp. 1–14.——"*Tectona grandis*," in Pharmacographia Indica, Dymock, Warden & Hooper, iii. pp. 61–67.——Report on the Teak Trade in Siam, Vice-Consul Black, in Dip. & Cons. Rep. Misc. No. 357, 1895, pp. 1–9, with map of the Teak Districts of Siam.——"*Tectona grandis*," in Manual of Indian Timbers, Gamble, pp. 526–534. ——"Teak, *Tectona grandis*, Linn. fil." in Timbers of Commerce, Stone, pp. 170–171 (Wm. Rider & Son, Ltd. London, 1904).——"L'Exploitation des Forêts de Teck et Autres Bois à Java, Paul Serre, in L'Agric. prat. pays chauds, vi. 1, 1906, pp. 422–430. ——"Burma Teak," in Bull. Imp. Inst. iv. 1906, pp. 174–175.——"Le Commerce du Teck au Siam," in Bull. Econ. Gouvernement Général de l'Indo-Chine, No. 56, Sept. 1906, pp. 910–915.——"Das Teakholz," Hosseus, in Der Tropenpfl. xi. 1907, Beihefte, No. 5, pp. 343–399.——"*Tectona grandis*," in Comm. Prod. India, Watt, pp. 1068-1072.——Note on Best Season for Coppice Fellings of Teak (*Tectona grandis*), Hole, Indian Forest Dept. Pamphlet No. 16, 1910, pp. 1–29.——"Teak," in Dip. & Cons. Rep. Annual, No. 4417, 1910, "Trade of Bangkok," pp. 12–14. ——Memorandum on Teak Plantations in Burma, Leete, Indian Forest Dept. Bull. No. 2, 1911, pp. 1–21 with Diagrams (1) Relation between Age and No. of Stems, (2) Relation between Girth and No. of Stems, (3) Relation between Age and Girth, (4) Relation between Height and Girth.——Note on the Relative Strength of Natural and Plantation-grown Teak in Burma, Pearson, Indian Forest Dept. Bull. No. 3, 1911, pp. 1–9, with photograph illustrating the mode of fracture of Plantation-grown teak when (*a*) broken transversely, (*b*) under compression, and (*c*) under shearing pressure.——A Note on Some Statistical and other Information regarding the Teak Forests of Burma, Troup, in The Indian Forest Records, iii. part 1, 1911, pp. 1–73, pls. i.–vii., one map.——"Utilisation du Teck dans les constructions légères," Tabel, in Journ. D'Agric. Trop. xii. 1912, pp. 268–270.—— Report on the Afforestation of Togo with Teak and African Timber Trees, Unwin, pp. 1–53, illustrated; Issued by the Crown Agents for the Colonies (Waterlow & Sons, Ltd. London, 1912).——A Further Note on the Relative Strength of Natural and Plantation-

grown Teak in Burma, Pearson, Indian Forest Dept. Bull. No. 14, 1913, pp. 1–21.——"Teak from Nigeria," in Bull. Imp. Inst. xii. 1914, pp. 360–367.——The Indian Forester (edited at Dehra Dun, U.P.) numerous articles.

Clerodendron, Linn.

Clerodendron Bucholzii, *Gürke*; Fl. Trop. Afr. V. p. 301.

Old Calabar, Cross River, and known also from the Gold Coast, Cameroons, Gaboon and Uganda.

A climbing shrub, 2–3 ft., in swampy ground, flowers double white, Afikpo, Old Calabar (Hitchens, Herb. Kew); flowers fragrant, free flowering, Aburi Hills (Johnson, Herb. Kew) with strong wood, about ½ in. in diameter, Mabira Forest, Uganda, flowering November, fruiting in July (Ussher, Herb. Kew).

Clerodendron capitatum, *Schumach. & Thonn.*; Fl. Trop. Afr. V. p. 305.

Ill.—Bot. Mag. t. 4355.

Vernac. names.—Fuemomi (S. Nigeria, *Foster*); Iye (Lagos, *MacGregor, Dawodu*).

Lagos, Oban, Abeokuta, Onitsha, Katagum, and widely distributed in Tropical Africa.

An ornamental shrub with dense heads of white flowers.

Clerodendron Formicarum, *Gürke*; Fl. Trop. Afr. V. p. 297.

Ill.—Thonner, Blütenpfl. Afr. t. 134.

Vernac. name.—Bunghama (Angola, *Welwitsch*).

Old Calabar, and in Tropical Africa generally.

An ornamental shrub, bearing many flowered terminal panicles, corolla white.

Clerodendron fragrans, *Vent.* Jard. Malmaison, t. 70.

A biennial shrub, 3 ft. high. Inflorescence, a compact terminal corymb; flowers white or tinged with pink, single or double; leaves sub-cordate serrate, pubescent, 4–5 in. across, glandular at the base.

Ill.—Jacq. Hort, Schoenbr. iii. t. 338 (*Volkmannia japonica*); Ventenat, Jardin Malmaison, t. 70 (*Volkameria fragrans*); Bot. Mag. t. 1834 (double fl.); Drapiez, Herb. Amat. de Fleurs, ii. t. 98 (*V. fragrans*); Bot. Reg. (1838) t. 41 (single fl.); Blanco, Fl. For. Filip. t. 222 (var. *pleniflorum*).

Vernac. names.—Flor. de Muerto, Jasmin Hediondo (Porto Rico, *Cook & Collins*).

Native of China; naturalised in India and Tropical America.

An ornamental plant cultivated in the Botanic Garden, Old Calabar. Easily raised from cuttings or suckers, by means of which it spreads rapidly. Usually met with under cultivation in the double form.

Clerodendron myricoides, *R.Br.*; Fl. Trop. Afr. V. p. 310.

Ill.—Bot. Mag. t. 5838 (*Cyclonema myricoides*).

Lagos, and widespread in Tropical Africa.

A shrub 3–5 ft. high, ornamental; the upper lobes of the corolla white, the lower pale blue.

Clerodendron polycephalum, *Baker*; Fl. Trop. Afr. V. p. 300.

Vernac. names.—Aporo (Lagos, *Punch*); Yawa (Oyo, *Millson*, *Moloney*).

Lagos, Yoruba, and the Gold Coast.

An infusion of the leaves applied to snake-bite Lagos (Punch, Herb. Kew).

An erect shrub, 4 ft. high, flowers white, Ashanti (Chipp, Herb. Kew), a semi-creeping shrub, Lagos (Millen, Herb. Kew).

Clerodendron scandens, *Beauv.*; Fl. Trop. Afr. V. p. 304.

Ill.—Pal. de Beauv. Fl. Oware & Benin, ii. t. 62; Geel, Sert. Bot. v.; Bot. Mag. t. 4354.

Vernac. name.—Fire Foré (French Guinea, *Farmar*).

Lagos, Opobo, Cross River—Abokam, Ekom, and from Senegambia to the Cameroons.

A climbing shrub, ornamental, flowers with green calyx and white corolla.

Clerodendron sinuatum, *Hook.*; Fl. Trop. Afr. V. p. 295.

Ill.—Bot. Mag. t. 4255.

Lagos, Abeokuta, and also in Sierra Leone.

An erect shrub, of low habit, flowering freely from the extremity of every branch, the dense heads of blossom being pure white and very fragrant.

Clerodendron splendens, *G. Don*; Fl. Trop. Afr. V. p. 300.

Ill.—Bot. Reg. (1842) t. 7; Paxton, Mag. ix. t. 103; Hartinger, Paradisus Vindob. i. t. 55; Hortic. Univ. v. (1844) p. 325; Le Jardin, 1895, p. 30; Rev. Hort. 1902, p. 504; De Wildeman, Études Fl. Bangala, frontispiece.

Vernac. names.—Adabi (Yoruba, *Millson*); Batabata (Congo, *Burton*); Olourn (Lagos, *Millen*).

Widely distributed in West Africa.

A climbing shrub, 4–6 ft. high, very ornamental, bearing dense terminal panicles of bright red flowers.

Clerodendron Thomsonae, *Balf. f.*; Fl. Trop. Afr. V. p. 303.

Ill.—Bot. Mag. t. 5313; Trans. Bot. Soc. Edin. vii. 1863, t. 7 & t. 16 (fr. & seed); Ill. Hort. 1863, p. 358; Belgique Hortic. xiii. (1863) t. 10; Fl. des Serres, xv. (1862–65) t. 1534; Rev. Hort. 1867, p. 312; Rev. Hort. 1902, p. 504 (*C. Balfouri*); Journ. Hort. Scr. 3, xli. p. 135.

Vernac. names.—Egwa, Oviakuku (Benin, *Foster*).

Old Calabar River, Cross River and Niger Delta, found north to Kabba and Lokoja.

A climbing shrub, very ornamental, bearing many flowered cymes much laxer than in *C. splendens*, calyx white, corolla light crimson.

Clerodendron volubile, *Beauv.*; Fl. Trop. Afr. V. p. 297.

Ill.—Pal. de Beauv., Fl. Oware & Benin, t. 32.

Lagos, Abeokuta, and in West Africa generally.

An ornamental, more or less climbing shrub; calyx corolline, corolla persistent, changing from green to white; berries black, shining; flowering August to September, Golungo Alto (Hiern, Cat. Welw. Afr. Pl. iv. p. 843).

The Clerodendrons may all be readily grown from seed or cuttings and thrive in rich, light loam, well watered with free drainage.

Vitex, Linn.

Vitex Agnus-Castus, *Linn.* Sp. Pl. (1753), p. 638.

A deciduous shrub, 6–14 ft. high. Leaves usually 5-foliolate. Inflorescence a slender, terminal or axillary panicle; flowers small, white tinged with blue or lilac.

Ill.—Gaertner, Fruct. Sem. Pl. i. t. 56; Lam. Encycl. t. 541, f. 1; Plenck. Ic. t. 510; Schk. Handb. t. 177; Duhamel, Traite des Arbres, vi. t. 35; Sibthorp, Fl. Gr. t. 609; Woodville, Med. Bot. ii. (1832) t. 137; Nees von Esenbeck, Gen. Plant. Fl. Germ. vi. t. 51; Rchb. Ic. Fl. Germ. xviii. t. 1293; Moggridge, Fl. Mentone, t. 14; Gard. Chron. Jan. 27th, 1912, p. 52 (habit, trained on a west wall, in flower at Kew).

Vernac. names.—Athlak (Arabic, *Dymock*); Panjangusht (Persia, *Dymock*); El-ghar (Arabic, Jordan, *Vester & Co.*).—Chaste Tree, Monk's Pepper.

Lagos (Dawodu, No. 9, 1899, Herb. Kew). Native of Sicily and the Mediterranean region.

Leaves scented, used to spice dishes, Lagos (Dawodu, l.c.). The berries are imported into India, considered astringent, resolvent and deobstruant (Dymock, Warden & Hooper, Pharmacogr. Indica, iii. p. 76). Seeds pungent, acrid and aromatic, possessing some medicinal value—carminative, etc. The fine spikes, sometimes more than a foot long of blue and white flowers, make this plant of value also for ornamental purposes. Propagated from seed or cuttings, growing freely in light, well-drained soil.

Vitex Cienkowskii, *Kotschy & Peyr.*; Fl. Trop. Afr. V. p. 328.

Ill.—Kotschy, Pl. Tinneanea, t. 12; Notizbl. Bot. Gart. Berlin, 7th Nov. 1909, App. xxii. No. 2, p. 35, f. 12; Engl. & Drude, Veg. Erde, ix. part 1, 1910, p. 295, f. 261.

Vernac. names.—Dinya or Dumya (Sokoto, *Dalziel*); Galbiji (Fufulde, *Dalziel*); Edi (Nupe, *Barter*); Ori-nla (Oloke-Meji, *Dodd*); Inguli Baub (Sierra Leone, *Scott Elliot*); Umbindoio (Singuni, Gazaland, *Swynnerton*); Munwomozi (Lungoro, Uganda, *Dawe*); Upudu (Shire Highlands, *Adamson*); *Hoové* (Kafir, *Johnson*); Muxillo-xyllo (Golungo Alto, *Welwitsch*).—Black Plum of Sierra Leone.

Lagos, Ilorin, Nupe, Sokoto, Bornu, and widely distributed in Tropical Africa.

Fruit edible—eaten in Nupe (Barter, Herb. Kew), Lake Nyasa (Kirk, Herb. Kew), Unyoro (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 54), fleshy covering of fruit eaten by Kafirs (Johnson, Herb. Kew); the flesh which envelops the stone in the fruit is very oily (Hiern, Cat. Welw. Afr. Pl. iv. p. 836); and the seeds used for

making ink, Sierra Leone (*Scott Elliot*, Col. Rep. Misc. No. 3, 1893, p. 31).

The bark is used in making Mallam's ink, together with the fragrant resin of *Boswellia Dalzielii*, Hutchinson (the "Ararabi" or "Hararabi" of the Hausas, and *Boswellia odorata*, Hutchinson, the "Hanu" of the Hausas "Andakehi," in Fufulde), both trees abundant in Yola Province and frequently planted as a fence enclosing the native compounds (see Kew Bulletin, 1910, pp. 137–138, for the description of these *Boswellias*, named since the publication of *Burseraceae*, Holland, Kew Bull. Add. ser. ix. p. 140).

An evergreen tree, 40 ft. high, Oloke-Meji (Dodd, Herb. Kew), very common, Nupe (Barter, Herb. Kew), over Northern Nigeria (Dalziel, Herb. Kew), and over the iron plateaux 500–3000 ft., Sierra Leone (Scott Elliot, Herb. Kew), in Savannah, Ashanti (Chipp, Herb. Kew), and a large umbrageous tree about 80 ft., flowers lilac, sea level, Mozambique (Johnson, Herb. Kew).

Vitex diversifolia, *Baker*; Fl. Trop. Afr. V. p. 324.

Nupe, Kontagora, Yoruba.

Fruit edible, size of a cherry, black when ripe, like the "Edi" or "Black Plum" of Sierra Leone (Barter, Herb. Kew).

A tree, 15 ft. high, flowers small, violet, Yoruba, common on dry, hilly ground, Nupe (Barter, Herb. Kew), Kontagora (Dalziel, Herb. Kew).

Vitex Fosteri, *C. H. Wright*, Kew Bull. 1908, p. 437.

A large tree; branches quadrangular. Leaves with 5–7 leaflets, elliptical, cuneate at the base, shortly cuspidate at the apex, sparsely puberulous above, pubescent below, 3 in. long, $1\frac{1}{2}$ in. broad; petioles 3 in. long, petiolules about $\frac{1}{2}$–$\frac{3}{4}$ in. long. Flowers small, calyx tube 2 lin. long; corolla tube 4 lin. long.

Vernac. name.—Ori eta (Oloke-Meji, *Foster*).

Oloke-Meji (Foster, No. 34, 1906, Herb. Kew).

Wood soft (l.c.), used for house-posts and the branches as scantlings (Thompson, List of For. Trees, S. Nig. 1910, p. 7, "Ori-eta" tree, *V. megaphylla*).

Vitex grandifolia, *Gürke*; Fl. Trop. Afr. V. p. 324.

Vernac. names.—Ore (Ebute Metta, *Millen*); Ori (Yoruba, *Thompson*); Oriri (Benin, *Thompson, Unwin*).

Lagos, Benin, and Niger Delta, and generally in W. Africa.

Fruit edible; Ekpe (Barter, Mus. Kew), size of a small plum from which a spirit is made, Ebute Metta (Millen, Herb. Kew); fruit made into a kind of honey, Asaba (Thompson, List of For. Trees, S. Nig. 1910, p. 7, *V. cuneata*).

The wood is used for making large drums, S. Nigeria (l.c. *V. cuneata*).

A small tree; with the habit of an *Aralia*, sea shore near the River Nun (Barter, Herb. Kew), 25 ft. high. Ebute Metta (Millen l.c.), a shrub 10 ft., flowers cream-coloured, Akwapim, 1000 ft. (Murphy, Johnson, Herb. Kew).

AVICENNIA, Linn.

Avicennia africana, *P. Beauv.*; Fl. Trop. Afr. V. p. 331.

Ill.—Pal. de Beauv. Fl. Oware & Benin, i. t. 47.

Vernac. names.—Ogbun (Lagos, *MacGregor*); Ede (Benin, *Thompson*); Garigari or Aguirigui (Gaboon, *Moloney*); Grigri or Garigari (Sierra Leone, *Scott Elliot*, *Moloney*).—White Mangrove.

Widely distributed on the littoral in West Africa.

Wood used in boat-building and for piles (Thompson, List of For. Trees, S. Nig. 1910, p. 7); for house work, Sierra Leone (Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 35); good for shipbuilding (Cat. Prod. Col. Franç. Ex. Univ. 1867, p. 46; Moloney, For. W. Afr. p. 402).

A specimen in the Museum, Kew (Mann, River Nun, 1861) has a specific gravity of 0·598 = 37 lb. per cubic foot.

The bark is used medicinally by the natives for the itch (l.c.).

A sample of the bark from Degema, New Calabar River, analysed at the Imperial Institute (Bull. Imp. Inst. 1913, p. 417) was found to contain only 12·5 per cent. of tannin and not rich enough to export to Europe in competition with East African Mangrove bark (see p. 304), though suitable for local use. It produced a somewhat harsh leather, of pale brown colour and firm texture.

A shrub or tree 6–40 ft. high; one of the tallest trees in the Mangrove association, Gold Coast (Chipp, List of Trees, Gold Coast (1913) p. 30), a shrub with milk-white flowers, island of Loanda, flowering and fruiting in October and sometimes a great tree, Loge River, Ambriz, flowering and fruiting November (Hiern, Cat. Welw. Afr. Pl. iv. p. 847); in Senegal the fruit has been observed in January (Dollinger, Herb. Kew). The distribution and conditions of growth are approximately those of the "Red mangrove" (*Rhizophora racemosa*, see p. 304) and the method of reproduction is the same, the seeds germinating on the trees and sending down their long primary radicles into the mud.

LABIATAE.

OCIMUM, Linn.

Ocimum basilicum, *Linn.*; Fl. Trop. Afr. V. p. 336.

Ill.—Lam. Encycl. t. 514; Plenck, Ic. t. 491; Nees von Esenbeck, Plant. Medic. Düsseld. t. 184; Hayne, Darst. Beschr. Gewächse, xi. t. 3; Guimpel, Abbild. Beschr. t. 137; Nees von Esenbeck, Gen. Plant. Fl. Germ. vi. t. 1; Blanco, Fl. Filip. t. 407; Bull. Econ. Indo-Chine, 1905, p. 1148.

Vernac. names.—Efirin wewe (Lagos, *Dawodu*); Patmagi (Gambia, *Brown Lester*); Camange (Island of Culion, *Merrill*); Albahaca (Porto Rico, *Cook & Collins*).—Sweet or Common Basil, Kirman Mint (Persia, *Dymock*).

Lagos, and widely distributed in Tropical Africa and Asia.

An infusion of the leaves used in fevers, Gambia (Brown Lester, Kew Bull. 1891, p. 274), by the natives as a cooling drink, Gambia (Ozanne, Herb. Kew); the leaves are also used in soups (Brown

Lester, l.c.) Various medicinal uses are attributed to the plant in India (Watt, Dymock, *seq.*).

An annual, 1–3 ft. high, commonly cultivated, reproduced freely from seed, easily grown and often met with as a weed.

Ref.—"*Ocimum basilicum*," in Dict. Econ. Prod. India, Watt, v. part 2, 1891, pp. 440–442.——"*Ocimum basilicum*," in Pharmacogr. Indica, Dymock, Warden & Hooper, iii. pp. 83–85.

Ocimum canum, *Sims*; Fl. Trop. Afr. V. p. 337. [*Ocimum americanum*. Mill.].

Ill.—Jacq. Hort. Bot. Vindob. iii. t. 86 (*O. americanum*); Desc. Ant. iv. t. 301 (*O. americanum*); Bot. Mag. t. 2452; Blanco, Fl. Filip. t. 257, f. 2.

Vernac. names.—Efinrin Maragbosanyan (Oloke-Meji, *Dodd*); Efirin Oshu (Lagos, *Moloney*); Efirin nla (Lagos, *Dawodu*); Iyino (Old Calabar, *Holland*); Machericao or N-xilica (Golungo Alto, *Welwitsch*); Abahaca Cimarrona (Porto Rico, *Cook & Collins*); Kiranjan (Madagascar, *Heckel*).—Hoary Basil, Basilic commun, Basilic d'Amerique (*Descourtilez*).

Lagos, Abeokuta, Obukpani, Old Calabar, Nupe, Borgu, Kontagora, Zungeru; widely spread in Tropical Africa and Asia.

Leaves made into tea for children, Lagos (Moloney, Herb. Kew); a decoction used for dysentery, Accra (Brown, Herb. Kew), and used as salad, Old Calabar. Used medicinally in India (Watt, Dict. Econ. Prod. India) and in Madagascar for fever, etc. (Heckel, Ann. Inst. Col. Marseille, i. fasc. 2, 1903, p. 101).

Oil from this species, prepared at Dabàkala, Ivory Coast, has been examined by Roure-Bertrand Fils; it was at ordinary temperatures a crystalline mass owing to the separation of methyl cinnamate which constituted about 87 per cent. of the oil (Bull. Imp. Inst. 1914, p. 131).

An annual, 1–3 ft. high, commonly cultivated, often found wild about native towns and compounds, easily raised from seed.

Ref.—"*Essence D'Ocymum canum.*" Charabot, in L'Agric. prat. pays chauds, ii. 1902–03, "Etudes sur les Produits odorants des Col. Franç.," pp. 395–396.

Ocimum suave, *Willd.*; Fl. Trop. Afr. V. p. 338.

[*O. gratissimum*, var. *suave*, Hook. Fl. Brit. India, iv. p. 609.]

Vernac. name.—Romba (Madagascar, *Heckel*).

Kontagora (Dalziel, No. 138, 1905, Herb. Kew), and widely distributed in Tropical Africa and Asia.

Used medicinally in India (Dict. Econ. Prod. India) and in Madagascar (Heckel, Ann. Inst. Col. Marseille, i. fasc. 2, 1903, pp. 141–142, "Romba," *O. gratissimum*).

A much branched herbaceous perennial, found in a wood near native village, Kontagora (Dalziel, Herb. Kew), as a tall herb with clove-scented leaves, Chipete, Rhodesia, 3800 ft. (Swynnerton, Herb. Kew).

Ocimum viride, *Willd.*; Fl. Trop. Afr. V. p. 337.

Ill.—Pal. de Beauv. Fl. Oware, Benin, t. 94 (*O. heptodon*); Bot. Reg. (1823) t. 753 (*O. febrifugum*); Nature, Jan. 1st. 1903, p. 206 (leaves drawn from a dried specimen, raceme from Bot. Reg. (l.c.).

Vernac. names.—Efirin (Lagos, *Dawodu*; Sierra Leone, *Cole, Dunstan*); Aramoho (Benin, *Dennett*); Ntion (Eifik, Old Calabar, *Holland*); Mahopo (Batanga, *Bates*); Nonoom (Gold Coast, *Wilkins*).—Fever-bush, Tea-bush leaf, Sierra Leone Fever plant.

Itu, Cross River (Holland, No. 36, 1897, Herb. Kew), Benin (Dennett, No. 8, 1906, Herb. Kew), Abinsi, Muri Province (Dalziel, No. 773, 1912, Herb. Kew); and in West Africa generally.

Used as a febrifuge, Gambia (Dudgeon, Gambia Govt. Gaz. 6th March, 1909, p. 128), medicinally by the natives in fevers to promote perspiration, Sierra Leone, Fernando Po (Barter, Herb. Kew), by Europeans and natives as a febrifuge in Sierra Leone, where bundles of the plant are sold in the markets, and Brazil (Ghewy, Herb. Kew), as a medicine—for stomach and rubbed on the skin, lame back, Batanga (Bates, Herb. Kew), for dysentery, fevers, etc.—the leaves boiled with peppers, Aburi, Gold Coast (Johnson, Herb. Kew), and the leaf as a fever cure in West Africa, mixed with *Lantana Camara* (see p. 516) (African Lakes Corptn. Herb. Kew). Various medicinal uses are attributed to the plant, but chiefly as a febrifuge (see Shipley in Nature, *seq.*, Cole, Journ. Soc. Arts, liii. 1905, p. 1068, Holmes, Pharm. Journ. [3] viii. 1878, p. 563), and it is used as salad, Old Calabar.

The oil is orange-yellow, with an aromatic thyme-like odour and pungent taste. Leaves from Northern Nigeria yielded 1·21 per cent. (Bull. Imp. Inst. 1908, p. 209; 1914, p. 131), and from Sierra Leone (sample of 116 lb. yielding on distillation 6½ oz. of oil) 0·35 per cent. (Sierra Leone, Roy. Gaz. Jan. 11, 1908, p. 15; Bull. Imp. Inst. l.c.). The large proportion (32 per cent.) of thymol gives the oil some antiseptic value (l.c.), and it may prove a valuable source of this drug.

The plant has been recommended for driving away mosquitos, and it aroused considerable interest a few years ago; but experiments have proved that the plant is of no value for the purpose.

A perennial, 3–6 ft. high; may be grown as an annual, easily raised from seed and grows freely in almost any well drained soil; found on old farms, Munchi (Dalziel, Herb. Kew), common in open bush, Batanga (Bates, l.c.).

Ref.——"Fever Plant (*Ocymum viride*)," Holmes, in Pharm. Journ. [3] viii. 1878, p. 563.——"A Pot of Basil," Shipley, in Nature, Jan. 1, 1903, pp. 205–206.——"Mosquito Plants," in Pharm. Journ. [4] xvi. 1903, p. 659.——"The Mosquito Plant," in Pharm. Journ. [4] xvii. 1903, p. 230.——"The Mosquito Expeller, *Ocimum viride*," in Transv. Agric. Journ. ii. 1904, pp. 281–282.——"*Ocimum viride*," from West Africa," in Bull. Imp. Inst. vi. 1908, p. 209.——"Report on the Oil of *Ocimum viride* from Sierra Leone," Dunstan, in Sierra Leone Roy. Gaz. Jan. 11th, 1908, pp. 15–16.

Aeolanthus, Mart.

Aeolanthus pubescens, *Benth.*; Fl. Trop. Afr. V. p. 394.

Vernac. name.—Iko (Eifik, Old Calabar, *Holland*).

Lagos, Abeokuta, Old Calabar, Jeba, Mount Patti, Lokoja.

Used as a salad, Old Calabar.

A slender erect annual, 1–3 ft. high.

PLECTRANTHUS, L'Hérit.

Plectranthus floribundus, *N.E.Br.* in Kew Bull. 1894, p. 12; Fl. cap. V. 1, p. 773.

Rootstock tuberous. Stems erect, 2–4 ft. high. Leaves 2–3 in. long, ½–1 in. broad, oblong, obtuse, coarsely pubescent on both sides, base rounded or sub-cordate. Inflorescence a leafless panicle 12–18 in. long, with numerous simple or branched pubescent racemes 1–2½ in. long; corolla bright golden-yellow; pedicels 1½–2 lin. long.

Ill.—Hook. Ic. Pl. t. 2489.

var. **longipes**, N.E.Br.; Fl. Trop. Afr. V. p. 403, resembles the type, but the flowers have longer pedicels—2–5 lin. long. Tubers small and growing close to the base of the stem. A fresh tuber—on a plant grown at Kew (from Zaria, Lamb, No. 22, 1913) measured 1¾ in. long, ¾ in. in diam. at the thickest part tapering to ¼ in. in diam.; colour brown or somewhat like a new potato, whitish near the growing point.

Vernac. names.—Risga (Hausa, *Lamb*, *Dudgeon*); Risga (Yola, *Dalziel*); Bugumji (Fufulde, *Dalziel*); Buica (Manganja Hills, *Meller*).

Zaria (Dudgeon, No. 2, 1909, Lamb, No. 22, 1913, Herb. Kew); Yola (Dalziel, Kew Bull. 1910, p. 140); Kano (Dudgeon, l.c.); known also by specimens from Angola, Matabeleland, Nyasaland and other parts of East Africa.

The tuberous roots are cultivated for food in Yola (Dalziel, l.c. *Syncolostemon sp.*); Zaria (Lamb, l.c., Dudgeon, l.c., Parsons, N. Nig. Gaz. April 30, 1910, p. 103, "Risga"), Kano (Dudgeon l.c.), in East Africa—pleasant taste and of good flavour (Cameron, Herb. Kew), and a food plant in S. Rhodesia near Chirinda at 3800 ft. (Swynnerton, Herb. Kew). The "Umbondive" or "Kaffir Potato," the tuber of *Plectranthus esculentus*, N.E.Br. (Kew Bull. l.c.) is a favourite food of the natives in Natal.

Propagated by means of tubers. In Zaria they are carefully grown upon selected ground previously hoed and levelled; the surface is covered with branches of *Bauhinia reticulata* (see p. 263) and other forest plants until the stems have reached a height of one foot or more (Dudgeon, Agric. and For. Prod. W. Afr. p. 154). See also under *Coleus rotundifolius*, p. 531.

Ref.—"*Plectranthus floribundus*," in Kew Bull. 1898, p. 12–13.

SOLENOSTEMON, Schumach. & Thonn.

Solenostemon ocymoides, *Schum. & Thonn.*; Fl. Trop. Afr. V. p. 420.

Ill.—Pal de Beauv. Fl. Oware, Benin, t. 95, f. 1 (*O. monostachyum*).

Vernac. names.—Ikbawo Opolo (Lagos, *MacGregor*, *Dawodu*); Tumukum biri (Abinsi, N. Nigeria, *Dalziel*).

Lagos (Moloney, 1889; Dawodu, No. 27, 1899, No. 10, 1901, Herb. Kew), Nupe (Barter, No. 1281, Herb. Kew); Mt. Patti, N. Nigeria (Dalziel, No. 102); Abinsi, N. Nigeria (Dalziel,

Nos. 772, 798, 799, Herb. Kew), Zungeru (Dalziel, No. 140, 1905, Herb. Kew); Old Calabar (Holland, No. 74, 1897, Herb. Kew); and generally in West Africa.

Used medicinally for children, as a vegetable and as a pot-herb, Lagos (Dawodu, l.c.), leaves included in "Agbo" (see p. 50).

An annual, 3–4 ft. high; found by the wayside and in cultivated fields, Zungeru (Dalziel, l.c.), in open places in the bush, Sierra Leone (Scott Elliot, Herb. Kew), in Cassava fields and open bush, in flower (blue) March, Batanga (Bates, Herb. Kew), and in shady ravines, Nupe (Barter, l.c.).

Coleus, Lour.

Coleus rotundifolius, *A. Chev. & Perrot* in A. Chev. Vég. Util. de l'Afrique Trop. Franç. i. (1905), p. 119. [*Coleus dysentericus*, Baker, Kew Bull. 1894, p. 10; Fl. Trop. Afr. v. (1900) p. 437; *C. salagensis*, Gürke, l.c. p. 426; *Plectranthus Coppini*, Cornu, l.c. p. 420; *Germanea rotundifolia*, Poit. Encycl. Method. ii. (1811) p. 763; *Plectranthus ternatus*, Sims, Bot. Mag. (1824) t. 2460, *Plectranthus tuberosus*, Blume, Bijdr. (1825–26), p. 838; *Plectranthus rotundifolius*, Spreng. Syst. ii. (1825) p. 690; *Coleus rugosus*, Benth. in Wall. Pl. As. Rar. ii. (1831) p. 15; *Coleus tuberosus*, Benth. Lab. (1832), p. 59; *Coleus parviflorus*, Benth. in DC. Prodr. xii. (1852) p. 72].

Ill.—Rumpf, Herb. Amb. v. t. 132, f. 1 (*Glans terrestris costensis*); Bot. Mag. t. 2460 (*Plectranthus ternatus*); Gard. Chron. Aug. 12, 1893, p. 183, f. 35 (tuber, *Coleus tuberosus*); Heckel, Ann. Inst. Col. Marscille, 1901, fasc. 2, p. 8, f. 1 (fl. br.), p. 10, f. 2 (tubercles, *Coleus Coppini*); Bull. Soc. Bot. France, xlviii. 1901, p. 108 (tubers, *Plectranthus Coppini*); Revue Cult. Col. x. 1902, p. 130, ff. 1, 2 (*Coleus Coppini*); Rev. Hort. Bouches-du-Rhône, Marseille, 1902, p. 49, f. 1 (*Colcus Coppini*); Chevalier, Les Vég. Util. L'Afriq. Trop. Franç. i. fasc. 1, 1905, t. 1 (*C. rotundifolius*), t. 2 (vars. *alba*, *nigra*, *rubra*), t. 3 (attachment of the tubers), t. 7, ff. 2, 3 (sections of tubers, vars. *alba & rubra*), t. 8, ff. 1, 2, 4 (starch grains), p. 121 (habit—a field in Madagascar).

Vernac. names.—Tumuku (Hausa, Dalziel); Metabela (Fufulde, *Dalziel*); Tumbuku (Hausa, Gold Coast, *Tudhope*, *Saunders*); Krodyn (Yoruba, *Barter*); Ousounifing (Sudan, *Heckel*, *Bois*, *Cornu*, *Chevalier*); Voamitza (Madagascar, *Heckel*); Omimé (Madagascar, *Sims*); Oumimé or Houmime (Mauritius, *Baker*); Matambala (Magwambas, Transvaal, *Mingard*, *Pailliena & Bois*); Oussou-ni-fing (var. *nigra*) or Oussou-ni-gué (var. *alba*) (Bambara, French Sudan, *Chevalier*), [Gouroundou (Banda), Fa-Birama (Segou, Middle Niger), Ndougoni (Ngaos), Dazo rabi, Kouikeri, Mangouli, Mételé or Matélé (Central Africa) *Chevalier*)]; Innala (Ceylon, *De Silva*, *Chevalier*); Gotte Kelingan or Gotte Kelin (Portuguese in Malaya, *Rumphius*).—Hausa Potato, Fra-Fra (Gold Coast) Potato, Salaga (Togoland) Potato, Madagascar Potato.

Yoruba (Barter, No. 846, Herb. Kew); Lokoja (Dalziel, No. 103, 1909, Herb. Kew); Gold Coast (Johnson, No. 794, 1900: Tudhope,

Dec. 1912, Herb. Kew). Found under cultivation in many parts of Tropical Africa and in Java, Ceylon, Mauritius, Madagascar.

The tubers are used medicinally in dysentery, Yoruba (Barter, l.c.) as an external remedy for burns and scalds, Madagascar (Heckel, Ann. Inst. Col. Marseille, i. fasc. 2, 1903, p. 175; *Plectranthus ternatus*). They are eaten as food, like potatoes, in all countries where the plant is cultivated. The tubers, planted about 3–5 ft. apart in rich open soil, grow about 1 ft. high and come to maturity in from 5–10 months. The plant may also be propagated by cuttings which root freely. In Northern Nigeria "Tumuku" is cultivated in damp places upon the tops of broad ridges, propagated by means of sprouting eyes or sections cut off the tubers (Dudgeon, N. Nig. Gaz. July 31st, 1909, p. 157: Agric. & For. Prod. W. Africa, p. 154); grown in Yola (Shaw, N. Nig. Gaz. Feb. 28, 1910, p. 32), and in Bassa, where in the Boju district the value of the tubers is given for "1 jar dried 3d.; 1½ fresh 3d." (Kay, N. Nig, Gaz. Suppl. June 30th, 1913, p. xxv.). In Ceylon the tubers of "Innala" are regarded as superior in flavour to those of the English potato and fetch a higher price in the local markets; they come to maturity there in six months, and in the best lands the returns are given at from 4–5 cwt. (De Silva, Trop. Agric. xxiii. 1904, p. 717). Under experiment on the Gold Coast the yield per acre has been found to vary from 7244 lb.—¼ acre tubers, 5 ft. by 4 ft. in mounds, planted 5th March raised the following January at Coomassie (Ann. Rep. Agric. Dept. Gold Coast, 1911 (for 1910) p. 31); 4280 lb.—½ acre including 296 mounds, 330 lb. tubers planted 5 ft. by 4 ft. 26th Feb. and raised 16th December following, at Coomassie (l.c. 1914 (for 1913) p. 50); 3160 lb.—¼ acre planted with 86 lb. tubers yielding after 10 months, Tarquah (l.c. 1911, p. 27) and 1204 lb. at Tamale, Gold Coast (l.c. 1914, p. 58). At Fort Sibut (Krébedje) on plots containing 500 clumps to the are (119·6046 sq. yards) the following results have been obtained during the rainy season—var. *rubra* and var. *alba*, 50 kilog. per are from tubers, 45 kilog. per are from cuttings; var. *nigra*, 60 kilog. per are from tubers, 52 kilog. per are from cuttings; slightly less than half the above quantities were obtained from tubers of the same varieties grown during the dry season; and at a farm (Bessou) in the same region, by good tillage and manuring, the returns have been from 8000 to 12000 kilog. per hectare (Chevalier, l.c. pp. 145, 146). In Guadeloupe, tubers planted about 2 ft. 6 in. apart (about 8000 plants per acre), have yielded at the rate of about 15–20 tons per acre (Revue Cult. Col. x. 1902, p. 273).

Other figures might be quoted, but the above will be sufficient to show that considerable variation may be expected in the yield.

Under cultivation Chevalier notes three well marked varieties, distinguished according to the colour of the tubers as var. *nigra*, *rubra* and *alba*, and localised respectively as belonging chiefly to the French Sudan—distributed to most of the French Colonies—the Transvaal—distributed to the Congo, Indo-China, Madagascar, Mauritius—and the Oubangi and Upper Chari regions extending to the Niger. The Bambara names as indicated above

distinguish between the black and the white. The variety cultivated in Java (var. *javanicaminum*, Chev.) is regarded as being probably the same as the Sudan var. *nigra*. Plants growing at Kew from Zaria (Coll. P. Lamb, 1913) probably belong here; they have not yet flowered, but the tubers indicate the var. *alba*, Chev.

Ref.—" Le Matambala (*Coleus tuberosus*, Benth.); Introduction et Propagation au Gabon-Congo," Paillieux et Bois, in Revue des Sciences Naturelles Appliquées (Bull. Soc. Accl. France), 1891, pp. 684–686.——"*Coleus tuberosus*" in Gard. Chron. Aug. 12th, 1893, p. 183.——"*Coleus dysentericus*, *Coleus tuberosus*, *Plectranthus ternatus*, in "Tuberous Labiatae," in Kew Bull. 1894, pp. 10–14.——"Note sur un tubercle alimentaire nouveau du Soudan, l'Ousounify (*Plectranthus Coppini*), Cornu in Compt. Rendus, cxxx. 1900, pp. 1268–1271.——Sur L'Ousounifing du Soudan (*Coleus Coppini*), Heckel, in Ann. Inst. Col. Marseille, viii. 1901, 2nd fasc. pp. 1–15, illustrated.——L'Ousounifing (*Plectranthus Coppini*); Labiée a Tubercle Comestible," Bois, in Bull. Soc. Bot. de France, xlviii. 1901, pp. 107–110.——"Sur les Tubercles du *Coleus Coppini*, Heckel, et sur l'Acclimatation possible de cette espèce dans le midi de la France," Heckel, in Revue Cult. Col. x. 1902, pp. 129–133, illustrated.——"Le *Plectranthus ternatus* et le *Coleus Coppini* a la Guadeloupe," Guesde & Rollin (letters) l.c. pp. 273–274.——"Innala (*Plectranthus tuberosus*)," De Silva, in Trop. Agric. 1st April, 1904, pp. 716–717.——"*Coleus rotundifolius*," in "Les Coleus a Tubercles Alimentaires," Chevalier & Perrot, in Les. Vég. Utiles Afriq. Trop. Franç. i. fasc. 1, pp. 100–152, pp. 101–106, pp. 119–124, pp. 130–132, pp. 141–143, pp. 147–149, pp. 151–152, illustrated.——"Oussounifing (*Coleus Coppini*), Dumas, in L'Agric. prat. pays chauds, vi. part 1, 1906, pp. 170–171.

Hyptis, Jacq.

Hyptis pectinata, *Poit.*; Fl. Trop. Afr. V. p. 448.

Ill.—Ann. Mus. Paris, vii. (1806), t. 30.

Vernac. names.—Kunbar dawaki (Katagum, *Dalziel*); Jogbo (Lagos, *MacGregor*, *Dawodu*); Quinbumbo, Quinbungu, Quibumbo or Quimbumba (Angola, *Welwitsch*); Sangantsahandvolihy (Madagascar, *Parker*, *Heckel*).

Lagos, Idda, Katagum and Abinsi, widely spread in Tropical Africa. Native of Tropical America. Used as a medicine for horses, Katagum (Dalziel, No. 354, Herb. Kew) for children, Lagos (MacGregor, Dawodu, No. 207, Herb. Kew); in Madagascar—as an aromatic, tonic, vermifuge, antispasmodic, etc. (Heckel, Ann. Inst. Col. Marseille, i. fasc. 2, 1903, p. 145); as incense by the inhabitants of the Lifune and Dande region, Angola (Hiern, Cat. Welw. Afr. Pl. iv. p. 873).

An annual, 4–6 ft. high, found on old farms, Abinsi, N. Nigeria (Dalziel, l.c.), on hedges in villages, Madi (Grant, Herb. Kew), open grass and low bush, Sierra Leone (Scott Elliot, Herb. Kew), in sandy soil, N.W. Rhodesia (Rogers, Herb. Kew).

Hyptis spicigera, *Lam.*; Fl. Trop. Afr. V. p. 448.

Ill.—Desc. Ant. viii. t. 581.

Vernac. names.—Benefing (French W. Africa, *Vuillet*); Tené (French Guinea, *Milliad, De Wildeman*).

Nupe, Kontagora and Tropical Africa, and in Tropical America.

Seeds occasionally imported into this country (Mus. Kew; Moloney, For. W. Afr. p. 403); used for food in the same way as Sem-Sem (*Sesamum indicum*), Uganda (Dawe, Herb. Kew); oleaginous (Chevalier, Les Veg. Util. L'Afriq. Trop. France, i. p. 82; Scott Elliot, Col. Rep. Misc. No. 3, 1893, p. 24; Vuillet, L'Agric. prat. pays chauds, xii. 1 (1912), p. 163); preserved for food, Madi (Grant, Herb. Kew), used medicinally in the Antilles (Descourtilez, l.c. p. 300).

An annual, 5 ft. high, common in wet places, Nupe (Barter, Herb. Kew), Kontagora, (Dalziel, Herb. Kew), cultivated in gardens, Acholi country, Uganda (Dawe, Rep. Bot. Miss. Uganda, 1906, p. 54) by the Bandas of F.W. Africa around their huts, sown at the commencement of the rainy season and grows quickly (Chevalier, l.c.) and in French West Africa (Vuillet, l.c.); may be cultivated much the same as *Sesamum indicum* (q.v.).

Ref.—Le Tené Fi (*Hyptis spicigera*): Plante oléagineuse de la Guinée Française," Milliad, in L'Agric. prat. pays chauds, i. 1901–2, pp. 116–119.——" Note sur L' *Hyptis spicigera*," Teissonnier, in L'Agric. prat. pays chauds, ii. 1902–03, pp. 492–493. ——" Une Plante Oléagineuse de L'Afrique Tropicale," in Notices sur des Pl. Utiles Congo, De Wildeman, i. (Bruxelles, 1903), Art. iii. pp. 16–21.——" Note sur *L'Hyptis spicigera* ou Bénéfing: Oléagineuse indigène peu connu," Vuillet, Koulikoro, Nov. 11th, 1911, pp. 1–4 (Imprimerie du Gouvernement, Bamako) and in L'Agric. prat. pays chauds, xii. 1, 1912, pp. 163–166; Abstract, "A Little-known Oil-yielding Plant," in The Agric. News, Barbados, xi. 1912, p. 229.

Pogostemon, Desf.

Pogostemon Cablin. *Benth.* in DC. Prodr. xii. (1848), p. 156.

A shrub, 2–3 ft. high. Leaves fleshy, densely pubescent ovate-obtuse, margin somewhat lobed, crenate, 2–4 in. long $1\frac{1}{2}$–$3\frac{1}{2}$ in. broad. Inflorescence a spike 3–6 in. long. Flowers in whorls, closely arranged except near the base of the spike; corolla small, pink-purple (Merrill); but the plant appears to flower rarely or not at all under cultivation. *Pogostemon Patchouli*, Pelletier, Mem. Soc. Sc. Orleans, v. (1845), p. 277; var. *suavis*, Hook. f. Fl. Br. India, iv. (1885), p. 634.

Ill.—Mem. Soc. Sc. Orleans, v. (1844), t. 7; (*P. Patchouli*) Pharm. Journ. [1] viii. 1849, p. 574 (*P. Patchouli*); Hooker, London Journ. Bot. i. 1849, t. 11 (*P. Patchouli*); Piesse, Art of Perfumery, p. 175; Holmes, in Pharm. Journ. [4] ii. 1896, p. 223 (*P. Patchouli*); Perfum. & Essential Oil Record, Nov. 1913, p. 370, f. 1 (*P. Patchouly*).

Vernac. names.—Tilam Wangi (Straits Settlements, *Holmes*); Cablan (Philippines, *Blanco*).—Patchouli or Patchouly of European commerce.

Native of the Philippine Islands. Cultivated at Lagos and Abutshi (River Niger), etc.

The leaves are largely imported into Europe for the extraction of the perfume "Patchouli." They come especially into Grasse, the price being about 72 francs per 100 kilos (Perfumery & Essential Oil Record, May, 1914, p. 149). Dried leaves were placed among Indian shawls to keep away insects, and it is also said to give the characteristic smell to Chinese or Indian Ink (Hooker, London Journ. Bot. i. 1849, p. 329). Commercial Patchouli is sometimes adulterated with the leaves of *Urena lobata* (p. 68) the "Perpulut" of the Malays (Kew Bull. 1889, p. 137). The oil in the London Market is quoted at 17s. per lb. (Perfumery & Essential Oil Record, June 1915, p. 222); 20s. per lb. (l.c. Nov. 1915 p. 355).

West African Patchouli leaves, from plants grown by the Niger Company at Abutshi, appeared on the market about 1892 (Chemist & Druggist, Jan. 28th, 1893, p. 157). In May, 1890, Woodruff (see p. 35) reported that there were nearly 200 plants of Patchouli growing at Abutshi (Kew Bull. 1891, p. 94).

In Penang cuttings put in in January and planted out the last week in February 3 ft. apart, yielded when cut July 21st at the rate of 8980 lb. of leaves per acre in a green state, and after being dried for 10 days in a cool, airy shed the weight per acre was at the rate of 2120 lb.; a second cutting about 6 months later yielded approximatly the same, giving more than a ton of leaf per annum (Kew Bull. 1888, p. 133).

The cultivation is comparatively easy on lines similar to above, and full particulars are given in Kew Bull. 1888, pp. 135–139, and in the following references:—

Ref.—"Pucha-Pat or Patchouli (*Pogostemon Patchouli*)," in Hooker's London Journ. Botany, i. 1849, pp. 328–330.——"Patchouly (*Pogostemon Patchouli*, Lindl., *Plectranthus crassifolius*, Burnett)," in The Art of Perfumery, Piesse, pp. 174–177 (Longmans, Green & Co., London, 1879).——Patchouli (*Pogostemon Patchouli*, var. *suavis*)," in Kew Bull. 1888, pp. 71–74; pp. 133–134; 1889, pp. 135–139.——"Notes on the Cultivation and Curing of Patchouli and Its Adulteration," Wray, in Journ. Agric. Hort. Soc. India, viii. 1889, pp. 283–291.——"*Pogostemon Patchouli*," in Dict. Econ. Prod. India, Watt, vi. part 1 B, 1892, pp. 307–309.——"Note on Dilem and Patchouli," Holmes, in Pharm. Journ. [4] ii. 1896, pp. 222–224.——"The Patchouli Plant," Cons.-Gen. Skinner (Marseilles), in U.S. Cons. Report, Misc. No. 299, August 1905, pp. 255–256.——"Notes on Patchouli," in Museum Report, the Pharm. Soc. of Great Britain, Holmes, 1907–10, pp. 7–9.——"Patchouli (*Pogostemon Patchouli*, var. *suavis*, Hook. f. = *P. Cablin*, Benth.)," in Kew Bull. 1908, pp. 78–82.——"Notes on Patchouli," Holmes, in Pharm. Journ. [4] xxvi. 1908, p. 349.——"The Patchouli Plant of Commerce," Holmes, in The Perfumery and Essential Oil Record, Nov. 1913, pp. 369–371.

Leucas, R. Br.

Leucas martinicensis, *R. Br.*; Fl. Trop. Afr. V. p. 479.

Ill.—Transv. Agric. Journ. v. (1907), t. 226.

Wild Tea Bush (Gambia, *Brown Lester*).

Katagum, Kontagora, and widely distributed in the Tropics.

The whole plant is made into an infusion and used as a wash in fevers, Gambia (Kew Bull. 1891, p. 274).

An annual, 2–3 ft. high, found in waste places Katagum and wet places by streams, Kontagora (Dalziel, Herb. Kew).

Leonotis, Pers.

Leonotis nepetaefolia, *R. Br.*; Fl. Trop. Afr. V. p. 491.

Ill.—Bot. Reg. iv. (1818) t. 281; Bot. Mag. t. 3700; Wight, Illust. t. 176, f. 11 (*L. nepetifolia*); Wight, Ic. Pl. Ind. Or. iii. t. 867; Cook & Collins, Econ. Pl. Porto Rico (Contr. U.S. Nat. Herb. viii. 1903) t. 44.

Vernac. names.—Iku Ekun (Lagos, *Foster*); Kilanjananahary (Madagascar, *Heckel*); Maluvo, M'angilla, Maluvo-iamgilla, Maluvo-iamconco (Loanda, *Welwitsch*); Molonillo (Porto Rico, *Cook & Collins*); Matisúl (Bombay, *Moloney, Dymock, Watt*); Cordão do Frade (Brazil, *Moloney*); Rascamoño (Porto Rico, *Amades, Dymock*).—Catmint-leaved Leonotis.

Cosmopolitan in the tropics.

A decoction of the plant is used in diseases of the abdomen, Loanda (Hiern, Cat. Welw. Afr. Pl. iv. p. 879).

The ash obtained by burning the flower buds is applied to burns and scalds, Chutia Nagpur (Watt, Dict. Econ. Prod. India); the ashes of the flower-heads mixed with curds are applied to ringworm and other itchy diseases of the skin in India; a decoction of the leaves is used as a tonic and the juice mixed with lime-juice and rum is taken as a febrifuge, Porto Rico (Dymock, Warden & Hooper, Pharmacogr. Indica, iii. p. 125).

An annual, 2–5 ft. high, somewhat coarse in the leaf, but very ornamental when in flower; dense whorls, 2–2½ in. across, yellow, with large bracts. Easily grown, and commonly found as a weed in waste places.

Tinnea, Kotschy & Peyr.

Tinnea aethiopica, *Kotschy & Peyr.*; Fl. Trop. Afr. V. p. 497.

Ill.—Kotschy, Pl. Tinneanea, t. 11; Bot. Mag. t. 5637, t. 6744 var. *dentata*); Journ. Hort. Ser. 3, xxvi. p. 35.

Katagum (Dalziel, No. 108, 1907, Herb. Kew) and generally in Tropical Africa.

A shrub, 3–6 ft. high, ornamental, with a perfume of violets.